U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
PB-277 880

A National Environmental/Energy Workforce Assessment. Virginia

National Field Research Center, Inc, Iowa City, Iowa

Prepared for

Environmental Protection Agency, Washington, D C

Dec 77

PB 277 880

A National Environmental/Energy Workforce Assessment

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

Conducted by:

National Field Research Center, Inc.

P.O. Box 287

Iowa City, Iowa 52240

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO. PB277880
4. TITLE AND SUBTITLE A NATIONAL ENVIRONMENTAL/ENERGY WORKFORCE ASSESSMENT, Virginia		5. REPORT DATE December 1977 - Date of Completion 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) National Field Research Center, Inc.		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS National Field Research Center, Inc. P.O. Box 287 Iowa City, Iowa 52240		10. PROGRAM ELEMENT NO. 2BC651 (36) 11. CONTRACT/GRANT NO. Grant #T900591010
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Federal Activities (A-104) 401 M Street, S.W. Washington, D.C. 20460		13. TYPE OF REPORT AND PERIOD COVERED Phase I Final Report 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES Phase II will comprise approximately five volumes and will be available in September 1978. Phase III will be available in September 1979.

16. ABSTRACT

This study is one of 70 volumes assessing the workforce needs (manpower needs) for pollution control and abatement in the United States for the five-year period of 1976 through 1981. Seven fields for pollution control — air, noise, pesticides, potable water, radiation, solid waste, and wastewater — are analyzed, together with energy-related programs currently accentuated by the national effort to solve energy supply problems.

Designed as Phase I of a three-phase program, the complete assessment includes the following volumes: one each for the 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands; one for each of the ten EPA regions; a one-volume National Abstract; a volume on National Legislation; a volume on Business and Industry; and a four-volume National Summary. The information was gathered through extensive personal interviews with responsible federal, state, and local officials in every state; with officials of representative private industrial and commercial firms; and with representatives of national industrial and trade organizations.

Phase II will develop a broad national inventory of the entire range of post-secondary and higher education training offered in the pollution control and energy areas cited above, and Phase III will offer demonstrations for curriculum changes or modifications which appear necessary to assure an adequate and properly trained national environmental/energy workforce.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Planning Regional Planning State Planning State Agencies Federal Government Planning Labor Force Manpower Forecasting	Employment Economic Surveys Energy Management Pollution Control Environmental Management Environmental Education Environmental Sciences Conservation Environment	National Environmental/Energy Workforce Assessment	

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
Release Unlimited	20. SECURITY CLASS (This page)	127 22. PRICE PC A07 MF A01

EPA Form 2220-1 (9-73)

NATIONAL ENVIRONMENTAL/ENERGY

WORKFORCE ASSESSMENT

for

VIRGINIA

Conducted by:

NATIONAL FIELD RESEARCH CENTER, INC

Under Grant from:

UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

Grant #T900591010

1977

This document has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

National
Field
Research
Center, Inc.

Box 287 Iowa City, Iowa 52240 (319) 351-8789

INTRODUCTORY NOTE

The National Environmental/Energy Workforce Assessment was conducted by National Field Research Center, Inc. with main offices in Iowa City, Iowa. The following personnel have had primary responsibility for the Assessment and project report.

IOWA CITY, IOWA
Dr. Darold E. Albright, President
Paul E. Bridges, Executive Director
Dr. Richard L. Benesh, Project Director
Judith J. Gordon
Alan M. Stowell
Anita M. Stowell
Mary Kay (Edge) Wade

ATLANTA, GEORGIA
Elizabeth G. Nielsen, Regional Director
Robert Oxberger

DENVER, COLORADO
Nancy C. Dillenberg, Regional Director

SEATTLE, WASHINGTON
Steven Silva, Regional Director

WASHINGTON, D.C.
Frank E. Smith, Project Coordinator
Lloyd B. Chaisson, Assistant Project Coordinator
Jack F. Seum

Additional research and clerical assistance was provided by Frederick M. Wall, Maxine Wolfe, Margaret Fehn, Sandra Hogsed, Karen Kirchoff, Sharon Leiker, Marilyn Low, Mary McCormac, and Joan Urquhart.

FIELD OFFICES

ATLANTA
2700 Cumberland Pkwy
Suite 150
Atlanta, GA 30339
(404) 433-2644

DENVER
2600 S. Parker Rd.
Suite 160, No. 6
Denver, CO 80232
(303) 751-4962

SEATTLE
927 United Pacific Bldg.
1000 2nd Ave
Seattle, WA 98101
(206) 623-9170

WASHINGTON D.C.
1522 K Street, N.W.
Suite 600
Washington, D.C. 20005
(202) 223-9136

TABLE OF CONTENTS

	Page
ILLUSTRATIONS	iii
ACKNOWLEDGEMENT	vi
PREFACE	vii
FOREWORD	viii
STATE SUMMARY	1
COMMONWEALTH PROFILE	14
POLLUTION CONTROL AND ABATEMENT AGENCIES	16
POLLUTION CONTROL AND ABATEMENT PROGRAMS	19
I. Air	20
II. Noise	31
III. Pesticides	36
IV. Potable Water	42
V. Radiation	51
VI. Solid Waste	57
VII. Wastewater	63
VIII. Energy	94
SELECTED POST SECONDARY INSTITUTIONS WITH FORMAL ENVIRONMENTAL/ENERGY PROGRAMS	98
STATE LEGISLATION	103

NOTE: The Selected Bibliography is appended to each Regional Report.

ILLUSTRATIONS

Figure		Page
1	Commonwealth of Virginia, Air Quality Control Regions (AQCR)	22
2	Virginia State Air Pollution Control Board, Organizational Chart	30

Table		Page
I	Virginia, Attainment Status of National Ambient Air Quality Standards by Air Quality Control Region	24
II	Virginia State Air Pollution Control Board, Current (1976) Staffing Level	26
III	Virginia State Air Pollution Control Board, Workforce Projections to 1982 (est.)	27
IV	Community Noise Control Ordinances in the State of Virginia	32
V	Virginia Department of Health, Bureau of Industrial Hygiene, Workforce Projections to 1982 (est.)	33
VI	Virginia Department of Agriculture, Division of Regulatory Services, Pest and Point Regulatory Section, Current (1976) Staffing Level	39
VII	Virginia Department of Agriculture, Division of Regulatory Services, Pest and Paint Regulatory Section, Workforce Projections to 1982 (est.)	40
VIII	Virginia State Department of Health, Bureau of Sanitary Engineering, Water Supply Program, Current (1976) Staffing Level	43

Table		Page
IX	Virginia State Department of Health, Bureau of Sanitary ENgineering, Water Supply Program, Workforce Projections to 1982 (est.)	44
X	State of Virginia, Nuclear Electric Generating Units in Operation, Under Construction or Planned	52
XI	Commonwealth of Virginia, Distribution of State and Local Radiological Health Personnel by Personnel Category - FY 1975	53
XII	Virginia State Department of Health, Bureau of Industrial Hygiene, Radiological Health Section, Workforce Projections to 1982 (est.)	54
XIII	Virginia State Department of Health, Bureau of Solid Waste and Vector Control, Current (1976) Staffing Level	59
XIV	Virginia State Department of Health, Bureau of Solid Waste and Vector Control, Workforce PRojections to 1982 (est.)	61
XV	Inventory of Domestic (or Municipal) Wastewater Treatment Facilities: Ownership	63
XVI	Industrial No-Discharge Permits in Virginia	65
XVII	Commonwealth of Virginia, State Water Control Board, Current (1976) Staffing Level	74
XVIII	Virginia Waste Water Personnel by Location	75
XIX	Commonwealth of Virginia, Certified Waste Water Treatment Plant Operators, Current (1976) Staffing Level	79

Table		Page
XX	Waste Water Treatment Facility Staffing (From 1975 Study)	81
XXI	Commonwealth of Virginia, State Water Control Board, Workforce Projections to 1982 (est.)	82
XXII	Commonwealth Of Virginia, Waste Water Treatment Plant Operators, Workforce Projections to 1982 (est.)	83
XXIII	Commonwealth Of Virginia, Survey of Certification Practices	91
XXIV	Virginia Energy Office, Current (1976) Staffing Level	95

ACKNOWLEDGEMENT

Valuable support and assistance for this report were provided by the Virginia State Water Control Board, the State Air Pollution Control Board, the State Department of Health, and the Department of Agriculture and Commerce. Special thanks are extended to Mr. Edward Easlick, Manpower Services Coordinator, and Mr. Jack Vanderland, Training Supervisor, both of the State Water Control Board, for their valuable insight into the workforce and training aspects of the waste water program in the state, and to Mr. R.V. Davis, Executive Secretary of the State Water Control Board. Appreciation is also extended to Mr. Mike Petty of the State Water Control Board; Mr. William Meyer, Executive Director, Mr. Edward Hamlett, Staff Services Supervisor, and Mr. Henry Hughes, all of the State Air Pollution Control Board; Mr. Charlie Price, Mr. Jim Saunders, and Mr. Bryce Schofield, Director, all of the Bureau of Industrial Hygiene of the State Department of Health; Mr. Rowland E. Dorer, Director of the Bureau of Solid Waste and Vector Control of the Department of Health; Mr. Eric Bartsch, Director, and Mr. Bob Taylor, Training Officer, both of the Bureau of Sanitary Engineering of the Department of Health; and Mr. Harry Rust, Supervisor of the Pest and Paint Regulatory Section, Division of Regulatory Services, of the Department of Agriculture and Commerce.

PREFACE

This report presents existing workforce levels, training programs, and career potentials and develops staffing level projections (1976 - 1981) based on available information for the Commonwealth of Virginia in the environmental pollution control areas of air, noise, pesticides, potable water, radiation, solid waste, waste water, and energy. This study was carried out for the United States Environmental Protection Agency by National Field Research Center of Iowa City, Iowa.

The information and data presented in this report were compiled in large part from extensive interviews with professionals working in the respective areas and were supplemented by telephone surveys and research.

FOREWORD

The material herein contains the information and data collected for eight individual pollution control inventories conducted for Virginia. The format includes workforce profiles, projections, growth, and career potential for each of the areas investigated. Growth projections are necessarily based on best professional estimates developed from available information and represent what are felt to be realistic figures by experts in the respective areas. The pollution control areas considered by this study are as follows:

Air

Noise

Pesticides

Potable Water

Radiation

Solid Waste

Waste Water

Energy

National Environmental Energy Workforce Assessment

Phase I

VIRGINIA

State Summary

I. AIR

Air pollution control and abatement in Virginia is the responsibility of the State Air Pollution Control Board (SAPCB), created as an autonomous agency in 1967 with the enactment of Virginia's Air Pollution Control Law. The Board consists of five members, appointed by the Governor, and a staff whose function is the implementation of board policies. The board also includes seven regional offices located across the state.

Virginia contains seven Air Quality Control Regions (AQCR) as provided for in the State Implementation Plan (SIP). The following are included: National Capital Interstate, Eastern Tennessee-Southwestern Virginia Interstate, Central Virginia, Hampton Roads, Northeastern Virginia, State Capital, and Valley of Virginia.

Virginia's SAPCB has a current staffing level of 117 persons, although it is authorized a staff of 130. Budgetary constraints and attrition of personnel are considered to be responsible for the understaffing.

Although Virginia's SAPCB staff has decreased in number recently, (the largest number of people on the staff was 125, in 1975) program officials predict a staffing increase over the next five years. The increase will be small, averaging only four percent per year, due primarily to budget restrictions. The potential for future jobs in air pollution control at the state level in Virginia is limited at best.

II. NOISE

The environmental noise program in the Commonwealth of Virginia has been the responsibility of the Bureau of Industrial Hygiene of the State Department of Health. The Bureau is responsible for the enforcement of rules to control community noise. At present, there is only one person, a scientist, involved in the state's noise program on a half-time basis. The major function of this position is investigating noise complaints in industrial facilities, under the authority of the Occupational Safety and Health Act.

Professionals anticipate an increase to one full-time person in noise in fiscal year 1977, in order to comply with State Occupational Safety and Health Act (OSHA) regulations. Further expansion of staffing levels to three or four full-time professionals in the program is anticipated over the next two years.

Career potential in the noise program in Virginia is dependent, in large part, upon the availability of funds to expand the program over the next few years. If professional workforce projections hold true, there will be some limited career opportunity for scientists and technicians. Generally, a four-year degree will be required for scientists with acoustical backgrounds. Some specialized training in noise abatement and control will be desirable.

III. PESTICIDES

Responsibility for implementation of the pesticides program has been allocated to the Virginia Department of Agriculture and Commerce, Pest and Paint Regulatory Section, Division of Regulatory Services.

The current staffing level of Virginia's pesticide program consists of seven full-time people. These persons, professional and clerical, also have the responsibility for programs regulating paints and hazardous substances. In addition to the seven full-time persons, the pesticide program utilizes 17 agricultural field inspectors on a part-time basis. In addition to state program personnel, professionals estimate that there are 2,095 commercial applicators and 35,000 private applicators in the commonwealth that must be certified under the law.

Officials in the pesticides program have indicated that a growth in the program by about four persons in the next five years can reasonably be expected. Professionals indicated that these positions would be for full-time inspectors.

Only a limited potential is anticipated for careers in pesticides at the state level in Virginia. Although the percentage increase in the program appears to be significant, the small numbers of people involved limit the actual number of jobs available. The opportunities that do exist will be for field inspectors requiring, as a minimum, a bachelor's degree.

IV. POTABLE WATER

Authority for the protection of groundwater in the commonwealth is held jointly by the Department of Health and the State Water Control Board. The board is empowered to initiate rules and regulations governing the use and distribution of sources of groundwater, issue permits for such use, and impose penalties upon violators of the law. The Virginia State Department of Health has responsibility for the Water Supply Program through its Bureau of Sanitary Engineering. The program goal is to ensure the provision of safe and sanitary drinking water to all citizens.

At the state level, there are currently 38 persons working in water supply, not including members of the State Water Control Board. At the local level, there are approximately 1,500 water treatment operators.

Professional estimates indicate that the workforce in water supply at the state level in Virginia will nearly triple over the next five years. At the local level, the number of water treatment plant operators in the commonwealth is expected to increase significantly during this period.

Career opportunities in water supply in Virginia over the next five years appear promising. An increase in demand for engineers is anticipated, as well as for chemists and technicians. An expected increase in the number of water supplies in the state will result in an increased demand for certified operators.

V. RADIATION

Virginia has a permissive state statute which grants it the right to enter into agreement-state status with the Nuclear Regulatory Commission that would allow the state to assume greater responsibility in controlling radioactive materials. To date, Virginia has not obtained agreement status with the Nuclear Regulatory Commission (NRC). There are currently two nuclear electric generating plants in operation, and six more are planned or under construction.

Responsibility for the Virginia radiation program has been allocated to the State Department of Health, Bureau of Industrial Hygiene Radiological Health Section. At the state level, there is only one person currently employed in the radiation program. This person is a scientist and does not spend full-time in environmental radiation control activities.

Professionals in the field of environmental protection predict a very slight increase in workforce at the state level over the next five years. This increase will occur principally in three areas: nuclear power, radioactive waste disposal, and control of radiation from naturally-occurring sources. No regulatory program exists at present to control naturally-occurring radiation, but plans are being formulated to establish standards. This is the largest single source of population exposure to radiation, and the only source that has not received extensive study.

VI. SOLID WASTE

The solid waste management problem in Virginia was recognized in 1965 with a resolution by the State Health Department to require local communities to notify the Department of their solid waste management plans.

Of the Virginia land area, 75% is considered to be rural. The availability of land makes landfilling the most common means of disposal. Since state regulations became effective, 197 sanitary landfills have received permits. Of these, 148 (75%) are publicly owned and operated while the remaining 49 are privately owned and operated.

Other methods of dealing with solid waste in Virginia include incineration and resource recovery. One resource recovery facility is already in operation, and a second is in final construction stages.

The Bureau of Solid Waste and Vector Control has a current staffing level of ten people. This is indicative of a major increase in the program since, for most of its history, the program consisted of one person. Officials have indicated that there is generally one operator for each landfill and, therefore, there are at least 200 operators in the state.

Potential for careers in solid waste management in Virginia is described as limited, at best. Even though the state program will increase, few new jobs will be created.

VII. WASTE WATER

Almost all of the communities in Virginia have sewage treatment and most have secondary or higher levels of treatment. Under the permit system, all industrial plants have installed waste treatment systems, and most are considered to be relatively effective by professionals working in the program. There are estimated to be about 600 municipal waste treatment facilities in Virginia and an almost equal number of private facilities.

All authority for water quality or waste water programs in the Commonwealth of Virginia is vested in the State Water Control Board (SWCB). The board was established in 1946, with the enactment of water pollution control legislation. the State Water Control Board is composed of four program bureaus: the Office of the Executive Secretary, the Planning and Administration Section, and six regional offices. The majority of environmental jobs are located in the program bureaus and regional offices. The SWCB is composed of 345 persons.

Program officials estimate that there are 1,283 certified waste water treatment operators in the state and that this represents about half of the total number of operators in Virginia. Each certified facility must have at least one certified operator.

Growth in terms of SWCB personnel is expected to be low. Program managers anticipate the program to increase by about three to five percent over the next five years.

VIII. ENERGY

The Virginia Energy Office was created by an Executive Order of the Governor on September 6, 1974, to administer the State set-aside program for hardship and emergency allocation requirements and other programs which may later become necessary. It currently has a total staff of eleven persons and one position, that of deputy director, is currently vacant.

The Energy Office is anticipating increasing its staffing level to twenty persons within the next two years. The primary reason for staff growth is to implement the mandates required for formation of state energy and conservation plans under the Federal Energy Policy and Conservation Act. The Energy Office expects to recruit a technical services coordinator, a government programs coordinator, a communities and industrial programs coordinator, an assistant technical services coordinator, several assistants, and clerical support personnel.

COMMONWEALTH OF VIRGINIA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR [1]	117	122	127	131	136	140	4%
NOISE [2]	1	1	1	3	3	4	47%
PESTICIDES [3]	7	8	9	10	11	11	10%
POTABLE WATER [4]	38	52	66	81	94	110	24%
RADIATION [5]	1	1	2	2	3	3	30%
SOLID WASTE [6]	10	10	13	15	18	20	15%
WASTEWATER [7]	1628	1846	2070	2294	2518	2741	11%
ENERGY [8]	11	15	20	20	20	20	14%
TOTALS	1,813	2,055	2,308	2,556	2,803	3,049	11%

[1] The above represents only personnel of the State Air Pollution Control Board.

[2] The above does not include law enforcement agencies or the private sector for which figures were not available.

[3] The above includes state program personnel, but does not include an estimated 2,095 commercial and 35,000 private applicators that will require certification.

[4] The above does not include an estimated 2500 water supply and water treatment plant operators that will be required over the next five years.

[5] The above includes only state agency personnel.

[6] The above does not include private sector personnel for which figures were not available.

[7] The above includes both state agency personnel and certified wastewater treatment plant operators.

[8] The above includes only state energy agency personnel.

EDUCATION

The colleges and universities in Virginia have a variety of environmental education programs. Two notable programs are those of Virginia Polytechnic Institute and the J. Sargeant Reynolds Community College.

Virginia Polytechnic Institute offers both a Master of Science and a Ph.D. program in Civil Engineering with Environmental Emphasis. The programs are located at the Institute's campus in Blacksburg and include several environmental courses such as environmental engineering chemistry, environmental health, air pollution, and the design of water and sewer systems.

The J. Sargeant Reynolds Community College, located just outside Richmond, offers an Associate of Science Degree in Environmental Technology, with options in Environmental Health and Environmental Engineering. Reynolds has also been instrumental in working with the State Water Control Board and the Department of Health in the development and operation of the Virginia Wastewater Treatment Plant Operator Center. Although the Center is located at Reynolds, courses are taught both at Reynolds and at fifteen other community colleges throughout Virginia.

In addition to the above schools, the University of Virginia has both undergraduate and graduate programs in environmental sciences, Emory & Henry College offers a program in environmental studies, Virginia Military Institute and Hampton Institute have courses in environmental engineering, and Old Dominion University offers a program in environmental health.

LEGISLATION

The environmental/energy legislation for Virginia was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Impact Report Law

Environmental Quality Act

Air Pollution Control Law

Pesticide Use and Application Act of 1975

Pesticide Law

Groundwater Act of 1973

Solid Waste Disposal Law

State Water Control Law

Water and Wastewater Works Operators Law

Water Pollution Control Laws

National Environmental Energy Workforce Assessment

Phase I

VIRGINIA

State Report

13

COMMONWEALTH PROFILE

The Commonwealth of Virginia has an area of 40,817 square miles. Regionally, the Tidewater (Virginia coastal plain) consists of four peninsulas formed by the Potomac, Rappahannock, and York Rivers, and Chesapeake Bay. The Piedmont Plateau is a 100-mile wide band which stretches to the Blue Ridge and Shenandoah Mountains. Approximately one-third of state is tidewater, one-third in the rolling piedmont and transitional areas, and one-third in the western mountains and valleys.

Virginia's population increased by 17.2 percent between 1960 and 1970 and increased an additional 5.51 percent between 1970 and 1974. The 1975 population was estimated to be 4,967,000. Approximately 61 percent of the population lives in seven Standard Metropolitan Statistical Areas, (SMSA).

Virginia's per capita income was $5,671 in 1975. It rose 42.8 percent from 1969 to 1973 and continues to rise. Manufacturing industries provide jobs for more than 386,000 people. Total value added by manufacturing is $6.9 billion per annum. Products manufactured include chemicals, textiles, food, clothing, lumber, furniture, paper, electrical machinery, transportation equipment, and cigarettes.

Although five times as many people are employed in industry, agriculture remains an important segment of Virginia's economy. In 1975, farm receipts totaled $977 million. Major crops are tobacco, peanuts, apples and sweet potatoes. Corn, vegetables, barley and peaches are

important corps. The $1.1 billion annual mineral production is largely due to coal (about 70% of the state's). Lime, zinc, and stone comprise the remainder. The 1975 fish catch was valued at $33 million. Twenty-five million out-of-state travelers generated $1.2 billion worth of business in 1974. Tourists are drawn by Virginia's numerous historical attractions and recreational facilities.

VIRGINIA POLLUTION CONTROL AND ABATEMENT AGENCIES

Responsibility for Virginia's pollution abatement and control activities is shared by the State Department of Agriculture, the State Air Pollution Control Board, and the State Water Control Board, under the authority of the Office of the Secretary of Commerce and Resources; and by the State Department of Health and the Division of Laboratory Services, under the authority of the Office of the Secretary of Human Affairs.

The State Air Pollution Control Board is composed of five members, appointed by the Governor, who carry out the major functions of administration, enforcement, engineering, and technical services for Virginia's air pollution control program. The board is entitled to the legal services of the State Attorney General's Office and has the authority to name technically qualified citizens to a Technical Advisory Committee. A large degree of administrative power is delegated to an Executive Director who in turn appoints: 1) an Assistant Executive Director for Technical Services, who supervises the Divisions of Monitoring and of Planning and Automated Data Processing; and 2) an Assistant Executive Director for Enforcement, who has supervisory responsibility for the activities of the Divisions of Engineering, Compliance, and Operations and Procedures.

A Public Information Officer formulates and conducts a public information program designed to advance the cause of clean air in Virginia by fostering wide awareness and understanding of the nature of the problem and the agency's approach, which promotes acceptance of and compliance with the clean air program by owners of emission sources and broad support for that program by the public. In addition, there is a Staff Services Supervisor who supervises the administrative and logistical staff support necessary for the Air Pollution Control Board to perform its mission and such other special projects as may be assigned.

Virginia's water quality program is the responsibility of the State Water Control Board. The Board's activities include, briefly: NPDES permit issuance and compliance; management and administration of all water quality activities; administration of the Construction Grants Program; water planning, including Section 208 activities; support and maintenance of an operator training program; investigation of pollution complaints, such as oil spills; groundwater management; conducting a monitoring program; review and evaluation of Environmental Impact Statements; administration of the 401 certification program, the Facilities Operation and Maintenance Program, the Environmental Damage Cost Recovery Program and Field Studies Program; and non-point source control.

An Executive Secretary oversees the activities of the Assistant Executive Secretary in charge of Programs, the Deputy Executive Secretary in charge of Operations, the Assistant Executive Secretary in charge of Planning and Administration, and the Public Information Officer.

The Programs Section is divided into four bureaus, each with its own functional divisions. The Bureau of Applied Technology is composed of the Divisions of Industrial Programs, Municipal Programs, and Training and Special Services. The Bureau of Enforcement is composed of the Divisions of Environmental Affairs and Legal Affairs. The Bureau of Surveillance, Ecological Studies, and Surface Water Investigations. The Bureau of Water Control Management includes the Hydrologic, Planning, and Special Projects Divisions.

The Operations Section carries out its functions in the Southwest, West Central, Valley, Northern, Piedmont, and Tidewater Regional Offices.

The Planning and Administration Section includes the Divisions of Administration, Automated Data Processing, Construction Grants, and Planning.

The Virginia State Department of Health has responsibility for the water supply program through its Bureau of Sanitary Engineering; the solid waste program through its Bureau of Solid Waste and Vector Control; the noise program through the Bureau of Industrial Hygiene; and the radiation program through the Bureau of Industrial Hygiene and Radiological Health.

The state pesticides program is conducted by the Pest and Paint Regulatory Section of the Division of Regulatory Services of the State Department of Agriculture and Commerce.

Analytical laboratory services are provided to the programs through the Division of Consolidated Laboratory Services of the Office of the Secretary of Human Affairs.

Pollution Control and Abatement Programs

I. AIR

A. Introduction

Air pollution control and abatement in Virginia is the responsibility of the State Air Pollution Control Board (SAPCB), created as an autonomous agency in 1966 with the enactment of Virginia's Air Pollution Control Law (Title X Chapter 1.2 of the Code of Virginia (1950) as amended). The Board consists of five members appointed by the Governor and a staff whose function is the implementation of Board policies.

The staff carries out four major functions of administration, enforcement, engineering, and technical services. The activities carried out in the performance of these functions, as listed in documents provided by program officials, are the following:

1) Administration
   a) Policy
   b) Administration and Fiscal Management
   c) Public information and education
   d) Intergovernmental liaison
   e) Legal counsel
   f) Staff training and development
   g) Program planning and evaluation
   h) Clerical support
2) Enforcement
   a) Inspections and compliance monitoring
   b) Field surveillance

c) Legal actions

d) Complaint handling

e) Implementation of emergency episode procedure

f) Source identification and registration

g) Clerical support

3) Engineering

a) Emission Inventory

b) Permit system and compliance scheduling

c) Source testing

d) Technical development of control regulations

e) Preparation of technical reports, guides and criteria on control

f) Design and review of industrial emergency episode procedures

g) Clerical support

4) Technical Services

a) Coordination of Laboratory Requirements

b) Operation of monitoring network

c) Data acquisition

d) Special field studies

e) Instrument maintenance and calibration

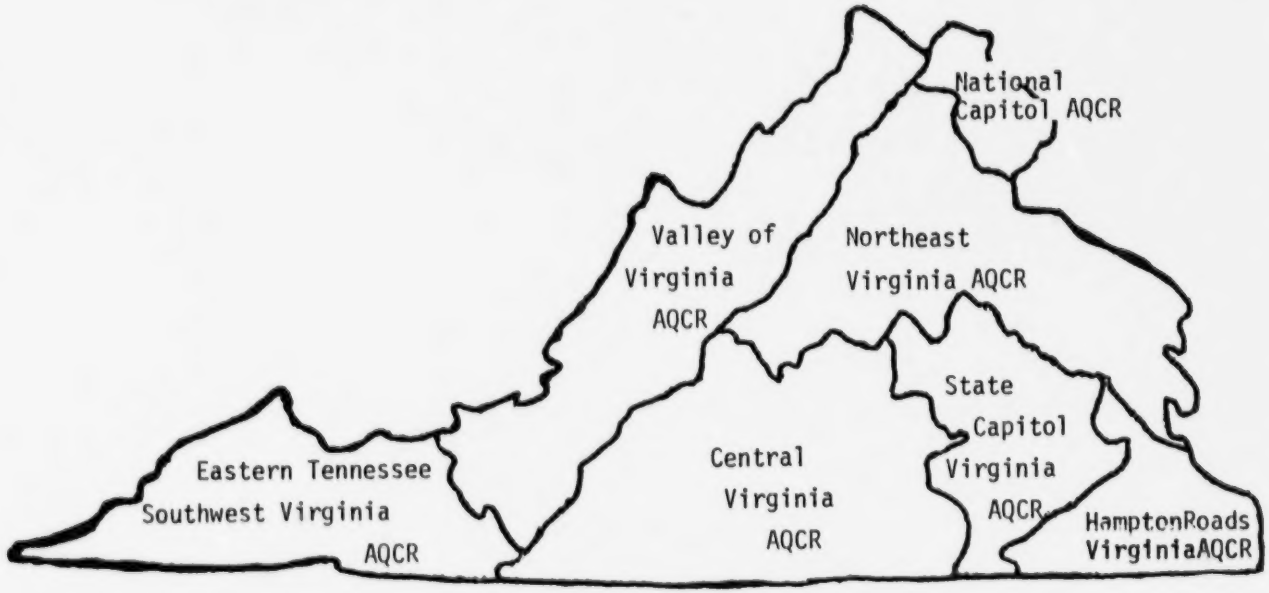
f) Clerical support.

The board is also comprised of seven regional offices around the state. The duties of this network include enforcement activities, supervision of monitoring and surveillance, coordination of local activity, and assistance to local jurisdictions. The regional offices and their locations are listed on the following page.

Figure 1.

COMMONWEALTH OF VIRGINIA

AIR QUALITY CONTROL REGIONS (AQCR)



NAME		LOCATION
I	Southwest Virginia	Abingdon
II	Valley of Virginia	Radford
III	Central Virginia	Lynchburg
IV	Northeastern Virginia	Fredericksburg
V	State Capital Region	Richmond
VI	Hampton Roads	Virginia Beach
VII	Northern Virginia	Falls Church

Virginia contains seven Air Quality Control Regions (AQCR) as provided for in the State Implementation Plan (SIP). Table I lists the AWCR's and their attainment status of national ambient air quality standards as of June 30, 1976, and provided by EPA's State Air Implementation Plan Progress Report. With respect to other portions of the SIP, one area of the state has promulgated a Transportation Control Plan. This is the northern Virginia portion of the National Capital Interstate AQCR for which EPA promulgated additional control measures. Virginia has also received federal approval for New Source Review and Emission Limitations. As of June 30, 1976, there were 572 major polluting installations (capable of emitting over 100 tons of a pollutant each year) in the state. Of these, 554 were in compliance with the state law and 18 were still in violation.

TABLE I

VIRGINIA
Attainment Status of National Ambient Air Quality Standards
by Air Quality Control Region[1]

AQCR \ Pollutant	TSP	SO_2	CO	O_x	NO_2
047. National Capital Interstate (Virginia portion)			AR	AR	
207. Eastern Tennessee-Southwestern Virginia Interstate (Virginia portion)	X			AR	
222. Central Virginia	X			AR	
223. Hampton Roads	X			AR	
224. Northeastern Virginia				AR	
225. State Capital	X			AR	
226. Valley of Virginia	X			AR	

[1]"X" indicates non-attainment of an applicable NAAQS, but no call for a SIP revision.

"AR" indicates non-attainment of an applicable NAAQS and a call for a SIP revision for attainment and maintenance.

"MR" indicates attainment of an applicable NAAQS, however, a SIP revision for maintenance is necessary.

A blank indicates attainment of an applicable NAAQS and no calls for SIP revisions.

Source: State Air Implementation Plan Progress Report: January 1 - June 30, 1976. Office of Air and Waste Management, U.S. EPA.

B. Workforce Profile

The information for this section was obtained primarily through on-site interviews with professionals working with the SAPCB and various materials provided by them. This information is applicable to the personnel of the board.

Virginia's SAPCB has a current staffing level of 117 persons, although it is authorized a staff of 130, with 13 vacancies. These include: 9 professionals, 1 technician, and 3 clerical positions.

It is expected that many of the vacancies will remain unfilled in view of the state's tax revenue shortfall and the decision of the General Assembly to give upgrade (pay raises) effective July 1, 1977 to state employees if revenues increase. Budgetary constraints and attrition of personnel are considered to be responsible for the staffing level under the authorization. As indicated in Table II, 33 are classified as engineers. Of these, 24 are classified by the state as Air Pollution Control Engineers, which requires a degree in chemical or mechanical engineering, preferably with an option in environmental engineering. The other engineers in the program are in administrative positions which require a degree in engineering or natural science.

Of the 39 scientists listed in Table II, 23 are Air Pollution Control Officers, a classification which requires a four-year degree in the natural sciences or engineering. Work experience may be substituted for education. Ten of the scientists are chemists, with degrees in chemistry or chemical engineering. One additional scientist is a meteorologist, and five others hold administrative positions. The board staff also employs two sanitarians and eight technicians, who

are required to have a high school education plus a minimum of two years experience in air pollution control or related environmental control work. College training in natural sciences or engineering, however, may be substituted for the work experience. Those persons classified as "other" in the table include 23 clerical positions. and 12 professionals with training and experience in accounting, statistics, planning, and public information.

TABLE II

VIRGINIA STATE AIR POLLUTION CONTROL BOARD

Current (1976) Staffing Level

Position	1976
Engineer	33
Scientist	39
Technician	8
Sanitarian	2
Other	35
TOTAL	117

C. Workforce Projections

Figures in this section are based on the best professional judgments of personnel working in the state's air pollution control program. They represent projected growth within the SAPCB.

Although Virginia's SAPCB staff has decreased in number recently, (the largest number of people on the staff was 125, in 1975) program officials predict a staffing increase over the next five years. The increase will be small, averaging only four percent per year as indicated in Table III. This is due primarily to budget restrictions, which are expected to limit growth and expansion of activities.

Workforce demand will continue for the same occupational categories as currently employed. State classifications have strict educational background requirements, and this is not expected to change. The greatest demand will be for scientists, or more specifically, Air Pollution Control Officers. There will also be a limited demand for technicians, engineers, and supportive personnel.

Turnover in the professional category is insignificant, and many of those currently working have been with the Board for several years. Nevertheless, attrition in the lower eschelons is considered moderately high. This frequently creates a problem, and the quality of the field work suffers.

TABLE III

VIRGINIA STATE AIR POLLUTION CONTROL BOARD

Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	33	35	36	37	38	39		2%
Scientist	39	41	43	45	47	49		5%
Technician	8	8	9	9	10	10		4%
Sanitarian	2	2	2	2	2	2		N/A
Other	35	36	37	38	39	40		2%
TOTAL	117	122	127	131	136	140	N/A	4%

D. Training and Certification

The Virginia SAPCB conducts a semi-annual visible emissions course. The attendance is estimated to be between 25 and 50 people at each session. Aside from this, the only training provided by the Board is informal on-the-job training for new employees of the Board to acquaint them with the state air pollution control law and regulations and

operations of the SAPCB. Program personnel estimated that most of the Board's professional employees have attended some EPA sponsored courses; in FY 1976, 29 persons from Virginia attended courses offered by EPA's Air Pollution Training Institute in Research Triangle Park, North Carolina. It was indicated by program managers that personnel are encouraged to enroll in job-related courses offered by local universities and that personnel are sent to seminars, workshops, and other training programs as often as possible.

E. Career Potential

The potential for future jobs in air pollution control at the state level in Virginia is limited at best. Due primarily to budget constraints, the SAPCB is expected to grow only slightly over the next five years. The opportunities that do exist will require professional training, for the most part. Air Pollution Control Engineers and Air Pollution Control Officers, which require four-year degrees, will be in demand. The state requirements for these positions have little flexibility except for the allowance of work experience to be substituted for the education requirements of the Air Pollution Control Officer. Few opportunities are expected to exist for those without four-year degrees, and those that do exist will be for technicians and clerical personnel.

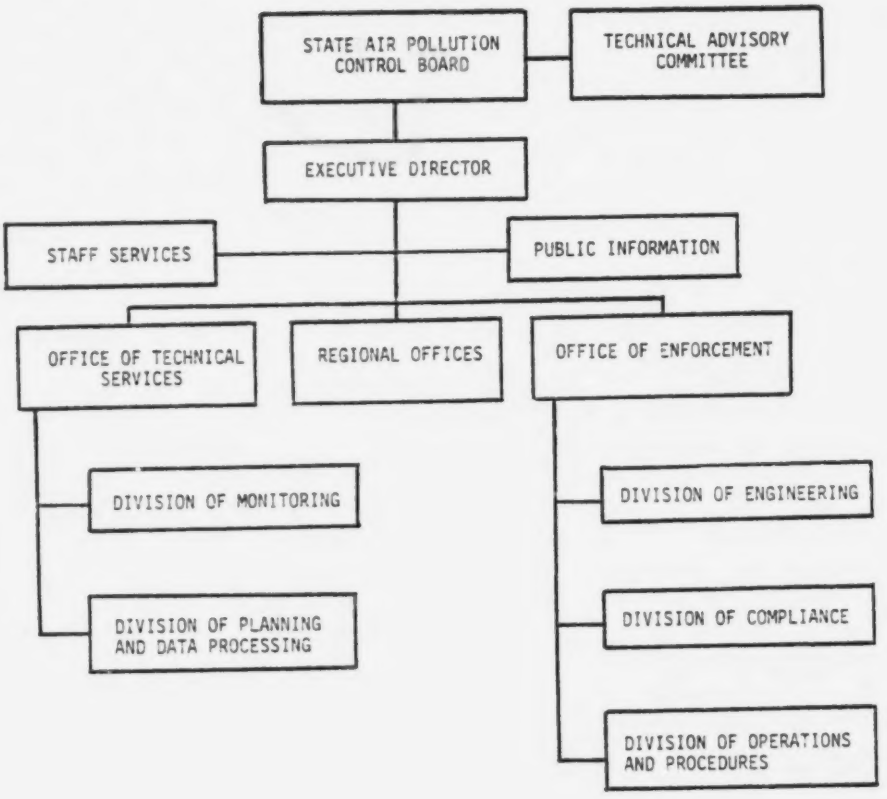
F. Conclusion

Virginia's State Air Pollution Control Board is responsible for the implementation and enforcement of the state's air pollution control law and regulations. The current staffing level of 117 is comprised mainly of professional persons, usually scientists and engineers. This is also expected to be the case over the next five years, and program professionals indicate that any increase in personnel will be small. Career potential is very limited, especially for persons without a college degree.

Figure 2.

VIRGINIA STATE AIR POLLUTION CONTROL BOARD

ORGANIZATIONAL CHART



II. NOISE

A. Introduction

The noise program in the Commonwealth of Virginia is the responsibility of the Bureau of Industrial Hygiene of the State Department of Health. The Bureau is responsible for the enforcement of rules to control community noise emanating from industrial and commercial sources. The Department of Health's authority in control covers all environmental noise problems, which includes industrial noise that extends beyond the boundaries of a particular industrial establishment. Noise within industrial facilities is covered under the federal Occupational Safety and Health Act.

Although there are no state standards for noise in Virginia, there are ten communities in the state with local noise ordinances. Of these, eight have regulations with regard to nuisance, nine have zoning regulations, four regulate vehicle noise, one has regulations covering recreational vehicle noise, and two regulate construction noise. This breakdown is depicted in Table IV on the following page.

TABLE IV

Community Noise Control Ordinances in the State of Virginia

Jurisdiction	Nuisance	Zoning	Vehicle	Rec/ Vehicle	Construc.	1970 Population
Alexandria	X	X	X	-	-	110,927
Arlington	0	X	X	-	-	174,284
Chesapeake	0	0	-	-	-	89,580
Fairfax	-	X	-	-	-	21,970
Hampton	0	0	0	0	0	120,779
Newport News	X	X	-	-	-	138,177
Norfolk	0	-	0	-	0	307,951
Richmond	0	0	-	-	-	249,621
Roanoke	X	X	-	-	-	92,115
Virginia Beach	-	X	-	-	-	172,106

KEY: X Regulation includes acoustical criteria
0 Regulation does not include acoustical criteria
- No regulation

Source: Sound and Vibration Magazine, December 1976, Clifford Bragdon, Consulting Editor.

B. Workforce Profile

Information concerning staffing levels for the noise control program in Virginia was obtained primarily through on-site interviews with professionals working on the program. The profile indicated is for persons working in the Bureau of Industrial Hygiene, specifically on the noise program.

At present there is only one person, a scientist, involved in the state's noise program on a half-time basis. The major function of this position is investigating noise complaints in industrial facilities, under the authority of the Occupational Safety and Health Act. This staffing level reflects the fact that the program does not

exist in the state budget despite the existence of local noise ordinances and the authority delegated to the Bureau of Industrial Hygiene to conduct a noise program in the commonwealth.

C. Workforce Projections

Although there are currently no environmental noise standards in Virginia and no funds allocated for noise control by the commonwealth, professionals anticipate an increase to one full-time person in noise in fiscal year 1977, in order to comply with State Occupational Safety and Health Act (OSHA) regulations. Further expansion of staffing levels to three or four full-time professionals in the program is anticipated over the next two years. In addition, new legislation in the area of noise control on the state or federal level would most likely have some impact on the noise program, but predictions as to how the workforce would be impacted are unapproachable at present.

TABLE V

VIRGINIA DEPARTMENT OF HEALTH

Bureau of Industrial Hygiene
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Scientist	1	1	1	2	2	2	N/A	20%
Technician				1	1	2	N/A	N/A
TOTAL	1	1	1	3	3	4	N/A	47%

D. Training and Certification

Due to the fact that there is only one half-time professional in the noise program, there is currently no formal training offered at the state level. If the program continues to go unfunded, no training programs will be needed. However, if new legislation in noise control makes funds available, new program personnel would be entitled to take advantage of informal noise control workshops sponsored by the U.S. EPA. At this time, EPA offers no formalized training in noise.

Positions in noise control and abatement normally require a four-year degree as a minimum, usually in engineering or a science such as physics. Normally this has been accomplished through the general programs offered in colleges and universities, with minimal training in specific disciplines of noise abatement and control.

E. Career Potential

Career potential in the noise program in Virginia is dependent, in large part, upon the availability of funds to expand the program over the next few years. If professional workforce projections hold true, there will be some limited career opportunity for scientists and technicians. Generally, a four-year degree will be required for scientists, with acoustical backgrounds. Some specialized training in noise abatement and control will be desirable.

F. Conclusion

The federal government encourages the states and municipalities to take the lead in noise control activities, which may have the affect of shifting the public job potential to those sectors. However, the absence of any granting or funding authority has seriously hampered growth of the program in Virginia, which lacks the necessary funding to operate the program without federal assistance. However, state compliance with OSHA regulations is expected to have some impact on noise activities in the state.

III. PESTICIDES

A. Introduction

Pesticides have been regulated in the Commonwealth of Virginia since 1948, with the passage of a pesticides registration and labeling act. This remained in force until 1970, when the original law was amended to include the use, misuse, and disposal of pesticides and pesticide products. The law was amended again in 1975 to add the certification of applicators and to generally bring the state's program into compliance with the federally mandated requirements of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). The current state law is now known as the Virginia Pesticide Use and Application Act of 1975.

Responsibility for implementation of the program rests with Virginia's Department of Agriculture and Commerce. Within the department, activities are carried out by the Pest and Paint Regulatory Section of the Division of Regulatory Services.

The 1975 law created, within the Department of Agriculture and Commerce, a Pesticide Advisory Committee, consisting of 12 members, whose functions are to advise the Commissioner of Agriculture and Commerce on pest control questions and environmental and health problems related to pesticide use and application. Members of the Committee include: three licensed operators; a commercial producer of food or feed commodities; an environmental health specialist from the State Department of Health; representatives from the agricultural chemical industry, the state Department of Agriculture and Commerce, the state Commission of Game and Inland Fisheries, the state Water Control Board,

and Virginia Polytechnical Institute and State University; an industrial user; and a private citizen.

Virginia has adopted ten categories of commercial applicator certification and five categories of private applicator certification. The commercial applicator certification categories include:

1) Agricultural Pest Control;
2) Forest Pest Control;
3) Ornamental and Turf Pest Control;
4) Seed Treatment;
5) Aquatic Pest Control;
6) Right-of-Way Pest Control;
7) Industrial, Institutional, Structural and Health Related Pest Control;
8) Public Health Pest Control;
9) Regulatory Pest Control;
10) Demonstration and Research Pest Control;

and the private applicator categories include:

1) General Certification;
2) Pesticide Class Certification;
3) Commodity/Crop/Site Certification;
4) Single Product Certification;
5) Single Product/Single Use Authorization (emergency use only).

B. Workforce Profile

Information for this section was provided primarily through on-site interviews with professionals working in the pesticides program and the use of materials and documents supplied by them.

The current staffing level of Virginia's pesticide program consists of seven full-time people, who are categorized into two occupational groups as illustrated in Table VI. The three persons classified as scientist are the program's supervisor and two assistant supervisors, all of whom are responsible for administrative and enforcement aspects of the program. These positions require as a minimum, a bachelor's degree in agriculture or life sciences. The four classified as "other" include clerical employees, who are responsible for the registration of pesticides, and secretaries. All of these persons, professional and clerical, also have the responsibility for programs regulating paints and hazardous substances. In addition to the seven full-time persons, the pesticide program utilizes, on a part-time basis, 17 agricultural field inspectors. These inspectors, located within the Agriculture Department, have primary responsibilities for feed and fertilizer inspections, and it is estimated by pesticide program officials that they spend approximately 25 percent of their time on pesticide inspections. The inspectors must meet the same job requirements as the other professionals in the program, that is, a minimum of a bachelor's degree in agriculture or life sciences.

In addition to state program personnel, professionals estimate that there are 2,095 commercial applicators and 35,000 private applicators in the state that must be certified under the law. It is estimated that there are several thousand others, primarily farmers, who are private pesticide applicators but will not require certification.

TABLE VI

VIRGINIA DEPARTMENT OF AGRICULTURE

Division of Regulatory Services
Pest and Point Regulatory Section
Current (1976) Staffing Level

Position	1976
Scientist	3
Other	4
TOTAL	7

C. Workforce Projections

Data contained in this section were obtained primarily form on-site interviews with program professionals and represent the best professional judgments of these persons.

Officials in the pesticides program have indicated that a growth in the program by about four persons in the next five years can reasonably be expected. Professionals indicated that these positions would be for full-time field inspectors, which the program needs. It is anticipated that this need will intensify after the initial certification program is completed and that inspection activities will increase to the point where full-time inspectors will be necessary. Four additional persons will not be able to handle all inspection activities, but program personnel estimated that this fugure represents the number of additional persons they are likely to get. Inspection activity will still have to be supplemented by the use, on a part-time basis, of other Agriculture Department inspectors. As mentioned in the previous section, inspectors must meet the job requirements for professionals, e.g., a bachelor's degree in agriculture or life sciences. Table VII illustrates staffing projections.

TABLE VII

VIRGINIA DEPARTMENT OF AGRICULTURE

Division of Regulatory Services
Pest and Paint Regulatory Section
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Scientist	3	4	5	6	7	7	N/A	19%
Other	4	4	4	4	4	4	N/A	N/A
TOTAL	7	8	9	10	11	11		10%

D. Training and Certification

Pesticide applicator training in Virginia is a cooperative effort between the Departments of Agriculture and Commerce and the State Cooperative Extension Service. The Extension Service has done the initial certification training and professionals in the program indicated that it was uncertain as to whether the Extension Service or the Agriculture Department would do the re-certification training. The state has used federal guidelines in establishing specialized courses for the various categories of applicator certification. The basic course used is the Pesticide Applicator Core Training Manual of the Northeastern Regional Pesticide Coordinator, prepared by Cornell University. Training is done on a regional basis for commercial applicators and in each county in the case of private applicators. As of January 1, 1977, officials indicated that 3,161 commercial and 9,165 private applicators had been trained.

E. Career Potential

Only a limited potential is anticipated for careers in pesticides at the state level in Virginia. Although the percentage increase in the program appears to be significant, the small numbers of people involved limit the actual number of jobs available. The opportunities that do exist will be for field inspectors requiring, as a minimum, a bachelor's degree in agriculture or life sciences.

Career opportunities for commercial applicators are difficult to predict, since no projections of workforce growth in this area are available. Since this appears to be the area with greatest personnel turnover, it can be assumed that the greatest career potential exists here. Other career possibilities may be available in the fields of integrated pest management and pesticide disposal, but figures are generally not available to provide information on the types of job or numbers of people that might be required.

F. Conclusion

The pesticide program in Virginia began in 1948, and changed over the years to bring it into compliance with federal laws. The program currently consists of seven persons engaged in certification, registration, and inspection activities. Although the level of activity is expected to increase, an addition of only four persons is anticipated, all in inspection activities. For this reason, few career opportunities are expected to develop.

IV. POTABLE WATER

A. Introduction

The Virginia State Department of Health has responsibility for the Water Supply Program through its Bureau of Sanitary Engineering. The mission of the program is to ensure that all public water supplies in the state provide safe and sanitary drinking water to all citizens. The federal government instituted a program to improve the quality of drinking water with the passage of the Safe Drinking Water Act (SDWA) in 1974. The establishment and enforcement of National Primary Drinking Water Regulations under SDWA provides for federal assistance to states through federal grants and the establishment of a program to protect underground sources of drinking water. The Groundwater Act was passed in Virginia in 1973 for precisely this purpose. According to the Act's Declaration of Policy,

> "It is the policy of the Commonwealth of Virginia and the purpose of this law to recognize and declare that the right to reasonable control of all groundwater resources within this State belongs to the public and that in order to conserve, protect and beneficially utilize the groundwater of this State and to ensure the preservation of the public welfare, safety and health, it is essential that provision be made for control of groundwater resources."

Authority for the protection of groundwater in the state is held jointly by the Department of Health and the State Water Control Board, which in empowered to initiate rules and regulations governing the use and distribution of sources of groundwater, issue permits for such use, and impose penalties upon violators of the law.

Each public water supply is required to monitor, test and otherwise operate in compliance with state and federal regulations. The water supply program and SDWA are aided in these efforts by the Federal Water Pollution Control Act which sets water quality standards and controls the release of pollutants into the water systems.

B. Workforce Profile

At the state level there are currently 38 persons working in water supply, not including members of the State Water Control Board. The 29 engineers hold degrees in civil or chemical engineering, as required by the state. In the "other" category, eight are clerical positions and one is a data management specialist. This breakdown is depicted in Table VIII.

TABLE VIII

VIRGINIA STATE DEPARTMENT OF HEALTH

Bureau of Sanitary Engineering
Water Supply Program
Current (1976) Staffing Level

Position	1976
Engineer	29
Other	9
TOTAL	38

At the local level, there are approximately 1,500 water treatment operators at present. Information regarding water supply personnel other than operators was unavailable at the time of this study.

C. Workforce Projections

Professional estimates indicate that the workforce in water supply at the state level in Virginia will nearly triple over the next five years. Technician positions are expected to be phased in by 1977, requiring a minimum of a Bachelor's degree in engineering technology or physical science. There is also expected to be some demand for chemists in the program by 1978. Table IX below provides a breakdown of projected staffing levels to 1982.

TABLE IX

VIRGINIA STATE DEPARTMENT OF HEALTH

Bureau of Sanitary Engineering
Water Supply Program
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	29	38	47	56	65	74	N/A	21%
Chemist	-	-	2	3	4	5	N/A	36%
Technician	-	2	2	4	4	6	N/A	38%
Other	9	12	15	18	21	25	N/A	23%
TOTAL	38	52	66	81	94	110	N/A	24%

At the local level, the number of water treatment plant operators in the state is expected to increase significantly over the next five years. At present there are approximately 1,050 water treatment plants in the state, employing at least one operator per plant. Permits have been issued for another 1,300 water supply systems in the state. Over

the next five years, an estimated 2,500 community water supplies will exist in the state and approximately 2,500 trained operators will be needed.

D. Training and Certification

Virginia became involved in operator certification in 1961, with the initiation of a voluntary program set up by the association for water and wastewater operators. A mandatory certification law was passed in 1970, requiring all water and waste water operators in responsible charge to be certified by January 1, 1973. A Board of Certification of Water and Waste Water Works Operators was established within Virginia's Department of Professional and Occupational Regulation to administer the program. The board is composed of seven members including the Executive Secretary of the State Water Control Board, the Director of the Division of Engineering of the State Department of Health, and five members appointed by the Governor, to include two representatives each from water and waste water facilities (each of whom has been certified), one representative each of owners of water and waste water plants, and one member from academia.

Program officials believe that the mandatory certification program is beneficial to both the state and the operator. They believe it has had a considerable impact in making operator occupations more desirable both professionally and financially.

Operator classifications in the Commonwealth of Virginia must be consistent with the water works classification designated by the State Health Department and the State Water Control Board. There are four

basic classes, I, II, III, and IV, Class I being the highest.

Plants are classified according to the following criteria.

Class I

Water works employing processes including, but not limited to chemical coagulation, sedimentation, filtration, disinfection, flouridation, aeration, corrosion control, or any combination thereof, serving a population of 50,000 persons or more or having a rated capacity of 5.0 mgd or more.

Class II

Water works employing processes including, but not limited to, chemical coagulation, sedimentation, filtration, disinfection, flouridation, aeration, corrosion control, or any combination thereof, serving a population of at least 5,000 persons, but less than 50,000 persons, or having a rated capacity of at least 0.5 mgd, but less than 5.0 mgd.

or

Water works employing processes including, but not limited to, chemical coagulation, sedimentation, filtration and disinfection, employing the high-rate filtration process and having a filter rate greater than 2.0 gpm/sq. ft. serving a population less than 50,000 persons, or having a rated capacity less than 5.0 mgd, and including all water works classified as Public Water Supplies not covered by a higher classification.

Class III

Water works employing processes including, but not limited to, chemical coagulation, sedimentation, filtration, disinfection, flouridation, aeration, corrosion control, or any combination thereof, serving a population of less than 5,000, or having a rated capacity of less than 0.5 mgd, and including all water works classified as Public Water Supplies not covered by a higher classification,

or,

Water works employing processes including disinfection, corrosion control, iron and manganese removal, softening, rechlorination, and other approved methods of treatment serving 5,000 persons or more,

or

Water works employing flouridation which are not under a higher classification and which are classified as Public Water Supplies.

Class IV

Water works employing disinfection, corrosion control, iron and manganese removal, softening, rechlorination, and other approved methods of treatment, or any combination thereof, except flouridation, which serve less than 5,000 persons and are classified as Public Water Supplies,

or

Water works employing no treatment and serving 400 persons or more.

Qualifications for plant operators, according to classifications, are as follows:

Class I

(a) Bachelor of Science degree in science or engineering and two years of responsible charge of operation of treatment plants of Class II or higher, or

(b) Fours years of college with a major in science and three years of responsible charge of operation of treatment plants of Class II or higher, or

(c) Holder of Class II certificate with five years of acceptable operating experience, two years of which are in responsible charge.

Class II

(a) Bachelor of Science degree in science or engineering and one year of responsible charge of operation of treatment plants of Class III or higher, or

(b) Associate of Applied Science degree in environmental technology awarded after completion of a two year course in water and wastewater plant operation and two years of acceptable experience in operation of treatment plants of Class III or higher, one year of which is in responsible charge or

(c) Two years of college with major in engineering, bacteriology, chemistry, or public health and three years of acceptable experience in operation of treatment plants of Class III or higher, one year of which is in responsible charge, or

(d) Graduation from high school and five years of acceptable experience in operation of treatment plants of Class III or higher, one year of which is in responsible charge, or

(e) Holder of Class III certificate and four years of acceptable experience in plant operation.

Class III

(a) Graduation from high school with training in chemistry or bacteriology and one year experience in operation of treatment plants of Class IV or higher, or

(b) Two years of high school or successful completion of two or more specialized courses under B-3 (a) above, and two years acceptable operation of treatment plants of Class IV or higher, or

(c) Successful completion of one or more specialized courses under B-3 (a) above, and three years acceptable operation of treatment plants of Class IV or higher, or

(d) Holder of Class IV certificate and four years of acceptable experience in plant operation.

Class IV

(a) Grammar school (8th grade) or equivalent education, completion of at least one specialized course under B-3 (a) above, and one year of acceptable operating experience.

In addition, all applicants for operation certification must be examined as to competence, knowledge and experience required for

the classification of certificate applied for. Candidates shall also be required to give evidence of good moral character, dependability, initiative, interest and judgment.

The Virginia Department of Health offers some direct training to state water supply personnel. Two short courses (one week each) were recently conducted for treatment plant operators; one was attended by 156 staff members, and the other by 40. A seminar conducted jointly with the American Water Works Association was attended by 100 water supply personnel.

The number of operators who hold bachelor of science degrees is increasing as operators take advantage of the several water treatment courses available. Reynolds Community College now offers a wastewater treatment course in conjunction with other Community Colleges, and is attempting to work in a course in water treatment as well. Northern Virginia Community College and Wytheville Community College offer programs in environmental technology. To date, at least 50 water supply employees have taken advantage of relevant courses offered through Clemson Correspondence School. In addition, some larger municipalities offer specialized training in water supply, and private industries in the state often sponsor seminars for water supply personnel.

E. Career Potential

Career opportunities in water supply in Virginia over the next five years appear promising. An increase in demand for civil and

chemical engineers is anticipated, as well as several new positions for chemists and technicians. An expected increase in the number of water supplies in the state will result in an increased demand for certified treatment plant operators.

Virginia expects to assume primacy for implementation of the Safe Drinking Water Act in the near future. Once this is accomplished, there is likely to be a heightening of program activities, with a resultant increase in workforce needs.

F. Conclusion

Virginia already has assumed responsibility for much of its water supply activities and will assume even more under primacy status. State and local workforce levels are expected to increase significantly over the next five years, particularly for engineers, chemists, technicians, and treatment plant operators.

Career training programs in water supply already exist at the federal, state and local government levels, and new programs are in the process of being developed. In addition, there are a number of schools in the state which offer training in water supply and related fields at the undergraduate and graduate college levels. Overall, the water supply program in Virginia appears to be making great strides in its assumption of primacy and in providing for the training and certification of treatment plant operators.

V. RADIATION

A. Introduction

Virginia's radiation program comes under the jurisdiction of the Bureau of Industrial Hygiene Radiological Health Section of the State Department of Health. At the federal level, responsibility for radiation control is shared by the U.S. Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), the Energy Research and Development Administration (ERDA), and the Department of Health, Education and Welfare (HEW). Authority for enactment and enforcement of radiation regulations is derived from several federal laws, including the Federal Water Pollution Control Act Amendments; the Safe Drinking Water Act; the Clearn Air Act; the Marine Protection, Research and Sanctuaries Act; and the Atomic Energy Act. Most of the authorities lie in issuing standards and providing technical assistance.

Virginia has a permissive state statute which grants it the right to enter into agreement-state status with the Nuclear Regulatory Commission, which would allow the state to assume greater responsibility in controlling radioactive materials. To date, Virginia has not obtained agreement-state status with NRC. However, the state participates with NRC in monitoring low-level radioactive emissions at the point of release at the state's two nuclear power plants. In addition, NRC had issued 354 licenses of by-product, source, and Special Nuclear Materials in Virginia by the end of 1975.

Virginia is authorized by law to carry out surveillance and measurement of radiation in water, shellfish, and milk. Regulations also provide for state authority in personnel training, airport baggage surveys, and emergency response planning. One full-time and one part-time program professional worked for two years in the preparation of the state emergency plan.

There are currently two nuclear electric generating plants in operation in Virginia, and six more plants planned or under construction. Table X below, provided by the NRC Annual Report of 1975, presents a brief description of these plants, their status, and scheduled operation date.

TABLE X

STATE OF VIRGINIA

Nuclear Electric Generating Units In Operation, Under Construction or Planned

Site	Plant Name	Capacity (Net MWe)	Type	Status	Utility	Scheduled Operation
Gravel Neck..	Surry Power Station: Unit 1	788	PWR	OL	Va. Elec. & Power Co.	1972
Gravel Neck..	Surry Power Station: Unit 2	788	PWR	OL	Va. Elec. & Power Co.	1973
Gravel Neck..	Surry Power Station: Unit 3	859	PWR	CP	Va. Elec. & Power Co.	1983
Gravel Neck..	Surry Power Station: Unit 4	859	PWR	CP	Va. Elec. & Power Co.	1984
Mineral	North Anna Power Station: Unit 1	898	PWR	CP	Va. Elec. & Power Co.	1977

TABLE X
(continued)

Site	Plant Name	Capacity (Net MWe)	Type	Status	Utility	Scheduled Operation
Mineral	...North Anna Power Station: Unit 2	898	PWR	CP	Va. Elec. & Power Co.	1977
Mineral	...North Anna Power Station: Unit 3	907	PWR	CP	Va. Elec. & Power Co.	1980
Mineral	...North Anna Power Station: Unit 4	907	PWR	CP	Va. Elec. & Power Co.	1981

OL - Operating License
CP - Construction Permit
PWR - Pressurized Water Reactor

B. Workforce Profile

At the state level, there is only one person currently employed in the environmental radiation program. This person is a scientist and does not spend full-time in environmental radiation control activities.

According to a 1975 HEW Report of State and Local Radiological Health Programs, state and local radiological health personnel have been involved in several aspects of radiation control. A breakdown by personnel category is presented in Table XI.

TABLE XI

COMMONWEALTH OF VIRGINIA

Distribution of State and Local Radiological Health Personnel by Personnel Category - FY 1975

Total	Program Administrators	Radiological Health Specialists
4 full-time		4 full-time
2 part-time	2 part-time	

C. Workforce Projections

Growth in the radiation program in the commonwealth will occur principally in three areas: nuclear power, radioactive waste disposal, and control of radiation from naturally occurring sources. Although no regulatory program exists at present to control naturally occurring radiation, plans are being formulated at the federal level to establish standards for the control of this source of exposure in the immediate future. This is the largest signel source of population exposure to radiation and the only source that has not received extensive study.

Professionals in the field of environmental protection predict a very slight increase in workforce at the state level over the next five years. This increase would be in the technician category, as indicated in Table XII below.

TABLE XII

VIRGINIA STATE DEPARTMENT OF HEALTH

Bureau of Industrial Hygiene
Radiological Health Section
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Scientist	1	1	1	1	1	1		
Technician			1	1	2	2		
TOTAL	1	1	2	2	3	3	N/A	N/A

D. Training and Certification

Due to the fact that there is currently only one person at the state level working in environmental radiation, no training programs, formal or informal, are offered. EPA's Office of Radiation Programs offers one course for professionals. This is an interagency course on emergency response planning conducted at the Civil Defense Preparedness Agency Staff College in Battle Creek, Michigan, and coordinated by the Nuclear Regulatory Commission (NRC). In addition to this course, EPA offers a variety of films and self-instructional materials to state and local governments on the transportation of radioactive materials. The bulk of the radiation training programs available to the states are conducted by NRC.

E. Career Potential

The potential for careers in radiation in Virginia will depend at least partially on the future of nuclear power facilities in the state. At the current rate of planning and construction, these power plants can be expected to provide a large number of jobs for nuclear engineers, scientists and technicians. The development of nuclear power will also affect the number of jobs available in radioactive waste disposal, since much of this waste in the future will be generated by nuclear facilities. Most of these jobs will be created in private industry.

F. Conclusion

Expansion of radiation program activities in Virginia is inevitable. Operation and construction of nuclear generative facilities in the state will produce a need for trained professionals in the areas of nuclear power and radioactive waste disposal. Adoption of standards for the control of naturally occurring radiation at the federal level is likely to have an impact on state radiation activities. Heightening of program activities in all areas of radiation control will result in an increased workforce in both the public and private sectors.

VI. SOLID WASTE

A. Introduction

The solid waste management problem in Virginia was recognized in 1965 with a resolution by the State Health Department to require local communities to notify the Department of what actions were being taken in solid waste management. In 1971, the legislature passed regulations governing solid waste and designated the Health Department to implement them. The regulations include requirements that each disposal facility hold a valid permit, that disposal in open dumps or in state waters is forbidden, and that the Health Department has the authority to inspect all disposal facilities. Monitoring wells and leachate collection provisions are required at some of the disposal sites.

Seventy five per cent of the land area of Virginia is considered to be rural or small-town. The availability of land makes landfilling the most common means of disposal. In a state survey completed in 1969, there were found to be 380 solid waste disposal sites, of which 75% were unsatisfactory. Since state regulations became effective, 197 sanitary landfills have received permits. Of these, 148 (75%) are publicly owned and operated while the remaining 49 are privately owned and operated. Most of the sanitary landfill sites are small; many handle 25,000 tons or less each year. Only three sites handle more than 150,000 tons; the largest facility, in the metropolitan Washington D.C. area, handles more than 1,500 tons per day. Program personnel indicate that at least two disposal sites are considered for each one approved.

Other methods of dealing with solid waste in Virginia include incineration and resource recovery. Five incinerators are in operation in the state in areas of heavy population concentration such as Norfolk, Williamsburg-Hampton, Richmond, Roanoke, and the Washington, D.C. metropolitan area. Several of these same areas are considering resource recovery facilities, and three have commissioned feasibility studies.

One resource recovery facility is already in operation, and a second is in final construction stages. The operational plant at the U.S. Naval Station in Norfolk produces 10% of the base's steam requirements. It has been in operation since 1967. The other facility is at the Naval Shipyard in Portsmouth. This will also be a steam-producing plant and is scheduled to begin operation in 1977.

Additionally, four communities in Virginia (Alexandria, Arlington, Lynchburg, and Salem) have facilities for the separate collection of wastes.

B. Workforce Profile

The information contained in this section was obtained primarily from on-site interviews with professionals working in the program and from materials and documents supplied by them.

Virginia's Bureau of Solid Waste and Vector Control has a current staffing level of ten people. This is indicative of a major increase in the program, since, for most of its history, there has been a staff of one person. The ten people are divided into three occupational

categories as indicated in Table XIII below. The two engineers consist of a sanitary and a chemical engineer. The six sanitarians are field inspectors and have some part-time responsibilities in vector control activities as well as solid waste. These persons have educational backgrounds in public health, agricultural engineering, biology, and physical sciences. Although not specifically required, program officials feel that a background in chemistry is desirable for both engineers and sanitarians. The "other" category consists of two secretaries.

TABLE XIII

VIRGINIA STATE DEPARTMENT OF HEALTH

Bureau of Solid Waste and Vector Control
Current (1976) Staffing Level

Position	1976
Engineer	2
Sanitarian	6
Other	2
TOTAL	10

Additional workforce in solid waste exists at the community level in landfill operations and waste collection and in the private sector in landfill operations, collection, and resource recovery. Because these activities are operated locally and independently of one another, no readily available staffing configuration exists. Officials have indicated, however, that there is generally one operator for each landfill and at least 200 operators in the state.

C. Workforce Projections

Data contained in this section are based on the best professional judgement of professionals working in the program and information in planning materials they were able to supply.

Within the Solid Waste Bureau, officials estimate that the workforce will double over the next five years. One reason for this is the expanded effort of the federal government in solid waste management and an increasing emphasis on resource recovery and hazardous waste disposal. The Bureau anticipated getting additional personnel as a result of passage of the Resource Conservation and Recovery Act and projections are based on this expectation, although the exact numbers and occupational categories of persons to be employed as a result of this Act are not known.

The projections in Table XIII show the largest increase occuring in the sanitarian category. This is due to the expectations of program officials that the current field inspection staff will be doubled. They also foresee the addition to the program of one geologist and a training officer who is included in the "other" category. It is anticipated that educational requirements for future jobs will be the same as current requirements.

Local and private sector workforce projections are difficult to obtain for much the same reasons that were discussed in the workforce profile section. The fact that local jurisdictions and industry operate independently of one another makes it virtually impossible to get an accurate projection.

TABLE XIV

VIRGINIA STATE DEPARTMENT OF HEALTH

Bureau of Solid Waste and Vector Control
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	2	2	2	3	3	3		10%
Sanitarian	6	6	8	8	10	12		16%
Geologist	0	0	0	1	1	1		20%
Other	2	2	3	3	4	4		17%
TOTAL	10	10	13	15	18	20		15%

D. Training and Certification

The only training done in Virginia's solid waste program is an informal on-the-job training for new employees in the program. This training is given by the Bureau's field inspectors. Program officials indicated that the state provides no training for operators.

Potential for future solid waste training activities exists under the recently enacted Resource Conservation and Recovery Act. The Act authorizes EPA to enter into grants or contracts for the development and implementation of programs to train individuals for occupations in solid waste management. It also authorizes funding for training instructors and supervisory personnel for the instruction and supervision of persons involved in the design, operation, and maintenance of solid waste disposal and resource recovery equipment and facilities. It is anticipated that this federal funding might serve as a catalyst for the state's training activities.

E. Career Potential

Potential for careers in solid waste management in Virginia are described as limited, at best. Even though the state program has a projected increase of 15% per year over the next five years, few new jobs will be created because of the program's size. The increased federal commitment to solid waste management through the Resource Conservation and Recovery Act may serve to elevate the program to a higher priority.

Careers will tend to shift from the conventional landfill and incinerator operators to more highly trained individuals for resource recovery operations. Opportunities will exist for engineers and scientists in the planning, design, and operation of these facilities. Although the demand for landfill operators is expected to decline, a certain number of these positions will continue to exist in the foreseeable future because resource recovery is not practical in many smaller communities and rural areas.

F. Conclusion

Virginia's solid waste program consists primarily of regulating landfill operations which are the most common form of waste disposal in the state. There are currently ten people employed in the state program, most of them as field inspectors. Program professionals anticipate doubling the program staffing level over the next five years but this will result in few new positions. The increased emphasis by the federal government on resources recovery indicates that future careers in solid waste management will, to a large extent, require professionally trained persons.

VII. WASTE WATER

A. Introduction

All authority for water quality or waste water programs in the Commonwealth of Virginia is vested in the State Water Control Board (SWCB). The board was established in 1946, with the enactment of water pollution control legislation which required permits for all dischargers. The law has been amended several times to provide better pollution controls and to reflect additional federal requirements. Almost all of the communities in Virginia have sewage treatment and most have secondary or higher levels of treatment. Under the permit system, all industrial plants have installed waste treatment systems, and most are considered to be relatively effective by professionals working the the program.

There are estimated to be about 600 municipal waste treatment facilities in Virginia and an almost equal number of private facilities. Table XV below indicates the number and ownership of municipal facilities according to a survey done by the SWCB in late 1975.

TABLE XV

Inventory of Domestic (or Municipal) Wastewater Treatment Facilities: Ownership

Type	City	Town	County	Schools	State	Federal	Total
Primary	14	33	11	1	3		62
Activated Sludge	4	9	21	14	15	55	118
Trickling Filter	11	39	15	2	12		79
Septic/Filter	--	--	--	141	24		165
Lagoons	5	36	31	50	11		133
TOTAL	34	117	78	208	65	55*	557

*Breakout of federal facilities by type not available but most configure as small (.050 - .060) package secondary units. The high absolute would be the Pentagon facility of 3.2 MGD which will soon be picked up by Arlington County.

The Water Control Board's responsibilities are implemented through a series of water pollution control programs. As described in the state's Water Quality Inventory Report of April, 1976, the programs and their activities are:

Municipal Construction Grant Program: The largest single factor in controlling water pollution in Virginia is the effective treatment of municipal sewage. The State Water Control Board (SWCB) has had the responsibility, since 1956, of administering State and Federal grants to enable communities to construct and/or expand sewerage facilities. In FY 75 and FY 76 the SWCB appropriated approximately $300 million to Virginia communities for construction of sewage facilities including 65 projects in FY 75 and 126 projects in FY 76 which were in the various phases of planning, designing and construction. Since 1971, the total sum of Federal and State grants allocated to Virginia communities for municipal sewerage facilities is over $604 million.

Combined Sewer Problems and Programs: A few of Virginia's older cities and communities developed their original sewerage systems utilizing combined sanitary and storm water collectors. In some instances the use of combined systems has resulted in overflows directly into State waters during periods of high intensity rainfall. The Water Control Board has worked with these communities over the years in their attempt to minimize these overflow occurrences, and in the major problem areas have recommended to the Federal government the need for Federal grant assistance to aid these communities in their overflow abatement programs.

National Pollutant Discharge Elimination System (NPDES): Virginia requested delegation of authority from EPA to continue to administer its own permit program in conformance with NPDES regulations. In April 1975, Virginia was granted the authority to administer the permit program.

Once a discharger receives a permit, the SWCB follows the plant's performance under a permit tracking system, which was initiated in January 1972. Under this system, waste treatment facilities are required to submit a monthly plant performance report which indicates the quality and quantity of the plant effluent, and whether any bypasses have occurred. The permit tracking program has made the spotting of violators relatively easy, so that remedial action can be initiated. Consistent violators have been identified and each has submitted SWCB approved remedial programs.

NPDES Permit Tracking: Under the permit tracking program, the SWCB monitors the total municipal sewage treated and discharged to State waters. From the 39 major municipal plants in the state, ranging in size from 2.0 mgd (million gallons per day) to 70 mgd, 81 percent of the sewage treated and discharged is tracked. The remaining 734 smaller plants are tracked on a monthly violator exception report which flags violations for follow-up.

A performance tracking program was begun in July 1975 for the 51 major industries in the State. This coincides with the issuance of most of the industrial NPDES permits. Before this time, most industries operated under State permits which had not set limits. Once NPDES permits were issued, it became possible to compare performance to established certificate limits.

Industrial No-Discharge Permits: The SWCB has issued a number of industrial no-discharge permits under the NPDES program. Table XVI is a summary of these no-discharge permits categorized by industry type that have been issued under the NPDES program.

TABLE XVI

Industrial No-Discharge Permits in Virginia

Industry Type	Number
Animal Waste	381
Slaughter House	25
Car Wash	14
Manufacturing	27
Food Processing	18
Sand and Gravel	16
Mining	32
Other	37
TOTAL	550

Source: State Water Control Board

A discharger who files a no-discharge application to the State Water Control Board is issued a no-discharge certificate provided the SWCB staff is satisfied that the facilities will have no discharge to State waters. Plans are reviewed, site inspections made, and where necessary possible groundwater pollution is investigated prior to approving the system for a no-discharge certificate.

The State has a requirement that all animal producers handling animal waste as a liquid must have a discharge certificate. Since most of the dischargers identified are not discharging wastes to Virginia waters, this accounts for the large number of animal waste certificates that have been issued.

Animal Waste Facility Certification Program: As of December 1, 1975, the State Water Control Board's animal waste program resulted in issuance of a total of 381 State "No-Discharge" Certificates to those operations in which animal wastes were handled in a liquid or semi-liquid form. This amounted to certification of 14 percent of the total number of hogs and pigs in the State, 11 percent of the dairy cattle and less than one-half percent each of beef cattle and poultry in the State.

Water Quality Planning: The Federal Water Pollution Control Act provides a water quality planning approach for each state, with a goal of high water quality for the nation. The law addresses water quality planning at three distinct levels: local, areawide, and basinwide. Provisions are included for control at all levels through the NPDES permit program. The State Water Control Board is strongly involved in the various planning levels.

Section 208 of the Act requires areawide waste treatment management plans in other areas "which as a result of urban-industrial concentrations or other factors, have substantial water quality control problems". Seven areas in the Commonwealth of Virginia have been designated by the Governor as qualified "208 planning areas". These are Fredericksburg, Hampton Roads, Richmond, Roanoke and southwest Virginia. In addition, northern Virginia and Bristol City are portions of interstate areas. All other areas of the State will undergo waste treatment management planning by the State Water Control Board under Phase II of the 208 planning process.

Water Quality Modeling: In order to predict the water quality parameters necessary for the issuance of NPDES permits in the State's water, the SWCB has used and developed a series of mathematical models. Mathematical modeling takes into account such factors as present water quality and predicted economic growth to determine stream conditions under different effluent loads for the stream segments defined by the Continuing Planning Process. These limits are then used to determine NPDES permit limits.

Surveillance Monitoring Programs: The Virginia State Water Control Board has an extensive monitoring and surveillance program. The program consists of monitoring the water resource of Virginia in the following areas: ambient quality monitoring, groundwater monitoring, compliance monitoring, sanitary surveys and pollution complaints and fish kill investigations.

B. Workforce Profile

Data for this section were compiled through on-site interviews with professionals working on the waste water program and by the use of various planning documents, studies, and reports supplied by these program personnel.

The State Water Control Baord is composed of four program bureaus, the Office of the Executive Secretary, the Planning and Administration Section, and six regional offices. The majority of environmental jobs are located in the program bureaus and regional offices. The following description of the board activities was provided by SWCB staff.

1) Bureau of Applied Technology

The Bureau of Applied Technology is responsible for providing consulting services to other Bureaus of the Board and to the regional offices on matters of a technical nature; central office management of the NPDES permit program; development and promulgation of standards for design, construction and management of sewerage systems; establishment of guidelines for industrial wastes systems; provision of expertise and technology transfer to the regional staffs on waste water systems design, operation and operator assistance; design review of major waste water treatment systems; development and training of personnel to operate sewerage systems; operation of central training facility; maintenance of State sewerage systems needs assessment program; evaluation of grant projects for cost-effectiveness and treatment compliance; liaison with the Federal government on matters pertaining to the permit program, manpower development and technological information; and such other technological functions as assigned by the Executive Secretary.

- Division of Industrial Programs

  The Division is responsible for: implementing and maintaining the State industrial permit program; recommending and establishing guidelines for chemical processes and pretreatment processes evaluations; reviewing the conceptual design of all major industrial waste water discharge proposals; establishing design standards for industrial waste water treatment facilities; establishing oil and hazardous substances regulations; establishing procedures to be utilized for evaluating agricultural waste applications and management practices; instructional assistance in technology transfer programs administered by the Division of Training and Services; and for the identification, assessment and development of special projects related to the activities of the Division; monitoring and follow-up of operational deficiencies; maintaining schedules for implementation of facilities corrections and improvements; preparation of reports relative to the permit program and other Bureau activities; and other related monitoring activities.

- Division of Municipal Programs

  The Division is responsible for: maintaining a high level of agency competency in the technologies of domestic waste water and urban runoff treatment; providing staff assistance in technology transfer programs; establishing criteria associated with treatment systems design and operation; evaluating new processes for their

acceptability; evaluation of grant projects for cost-effectiveness and treatment compliance; assisting new operations on start-up; and for the identification, assessment and development of special projects related to the activities of the Division; monitoring and follow-up of operational deficiencies; maintaining schedules for implementation of facilities corrections and improvements; preparation of reports relative to the permit program and other Bureau activities; and other related monitoring activities.

- Division of Training and Services

The Division is responsible for: maintenance of a comprehensive, state-wide manpower services program to serve current and anticipated training needs directed to assuring the continued availability of trained and motivated personnel to maintain an adequate water supply and for the prevention, control and abatement of water pollution; development, monitoring and updating of an inclusive permit information system; agency coordination of "natural disaster relief" damage assessment; coordination of grants needs assessments; administering technology transfer and other specialized training programs for State, public and private water and waste water personnel; maintaining liaison with State Operator Certification system and serving as consultant for State Certification Board; providing comprehensive technical plant operations assistance and training to regional personnel of the Water Control Board; coordinating development of a manpower planning system to relate manpower needs to training requirements; implementing operator training programs recommended under PL 92-500; serving as liaison to obtain training grant funds via Environmental Protection Agency and other Federal agencies; development of the waste water treatment plant operator training center at J. Sergeant Reynolds Community College.

2) Bureau of Water Control Management

The functions of the Bureau of Water Control Management are to develop and maintain state-wide water resource management plans; develop and maintain water quality management plans for each river basin; provide technical information and advice to any agency, political subdivision of this State, any community, association or person interested in the preparation or effectuation of any plan or program concerning the use of control of the water resources of the State in harmony with the State Water Resources Policy or as directed by the Executive Secretary; continue development of policy, rules and regulations for the implementation of the 1973 Groundwater Act and delineate critical groundwater areas; cooperate with and be the State agency representative on NEWS, NARS, TVA studies, Ohio River Basin Commission studies, and other Federal, interstate or special study commissions as assigned by the Executive Secretary; maintain a water quality/quantity data bank to include interfacing with Environmental Protection Agency/Storet and State ADP systems and other systems as may be authorized to

include surface and groundwater; cooperate with the Federal agencies (USGS, Corps, TVA, USDA, NOAA, Coast Guard, Water Resources Council, HUD), Virginia State agencies and universities on publication of standardized reports for all or part of the State concerning the hydrologic cycle and the State's waters; develop special staff reports for the Board as directed; provide economic analysis (agency-wide).

- Hydrologic Division

  The Hydrologic Division has the agency wide responsibility of making both surface water and groundwater hydrologic analyses in the preparation of hydrologic data for publication. The floodplain management program responsibilities and flood insurance responsibilities of the agency are carried out in the Hydrologic Division. The Hydrologic Division maintains liaison with and provides emergency service to the Office of Emergency Services and the offices of the National Weather Service during periods of flooding. Math modeling for groundwater analysis is conducted in this division. Implementation of the provisions of the Groundwater Act of 1973 are carried out in the Hydrologic Division.

- Planning Division

  The Planning Division personnel are engaged in river basin planning including the formulation and maintenance of state-wide water resources management plans. Water quality management plans on the river basin are formulated and updated in the Planning Division. Technical information and advice are provided by the Planning Division relative to river basin, water resources and water quality management plans. Cooperation with Federal, interstate and other water resources planning entities are provided by the Planning Division. Technical information and advice is provided by the Planning Division relative to water resources plans and water quality management plans formulated within the Division. The mathematical modeling program is conducted in the planning division including the formulation of models for water quality analysis, flood and drought flow analysis, and models for economic and cost effective analysis. The Division also gives assistance to the regional offices in the regional planning efforts.

- Special Projects Division

  Economic analyses required in the agency are made in the Special Projects Division.

3) Bureau of Surveillance and Field Studies

The Bureau of Surveillance and Field Studies is responsible for the following activities: monitoring of ambient and effluent quality; performing stream sanitary surveys; treatment plant efficiency studies; basin water quality studies; fish kill investigations; biological monitoring and benthic studies; stream gauging network (surface water investigations liaison with USGS; groundwater monitoring (chemical quality); pollution complaint investigations programs (PReP) - Oil and chemical spills; classification of lakes according to eutrophic state; environmental impact studies; non-point source studies; liaison with the Division of Consolidated Laboratory Services; coordination of all matters involving toxic substances including spills, effluent toxicity and environmental effects.

- Monitoring Division

  This division is responsible for formulating the program for water quality and groundwater monitoring. In addition to formulating these programs, the Division is responsible for the manner in which these programs are carried out by the regional office and for scheduling required samples for analysis.

- Surveillance Division

  This division is responsible for scheduling stream surveys as requested for maintenance of the state-wide stream gauging network, for NPDES effluent surveillance and for the design and scheduling of treatment plant surveys, maintaining the non-point source program, and basin-wide water quality studies which will be designed by the Division and coordinated with the various regions as necessary.

- Division of Ecological Studies

  This division is responsible for implementing the biological monitoring program; for all fish kill investigations; for implementation of the Clean Lakes Section, PL 92-500; for bioassays and benthic surveys and for environmental impact studies.

4) Bureau of Enforcement

The responsibilities and functions of the Director of the Bureau of Enforcement include state-wide enforcement of standards, policies, rules, regulations, orders, certificates and directives adopted or issued by the Board, General Assembly and Congressional liaison; liaison with the Attorney General's Office; development of amendments to standards, policies, rules and regulations for adoption by the

Board; conduct of all hearings; ensuring uniformity in and uniform compliance with State implementation plans and schedules.

The Director of the Bureau is responsible for the management of the State certification program required as a prerequisite for Federal permits and licenses (PL 92-500, Section 401); control, prevention and abatement of spills of oil and hazardous chemicals; coordination of review and comments on all environmental impact statements; recommendations for development of amendement of surface water quality standards; recommendations for appropriate policies, standards, rules and regulations relative to dredging, spoil disposal and protection of wetlands.

- Division of Legal Affairs

  The Division of Legal Affairs is responsible for the following activities:

  Enforcement

  The Division is responsible for the enforcement of the law, standards, policies, rules, regulations, orders, certificates and directives adopted or issued by the Board; ensuring uniformity in and uniform compliance with State implementation plans and schedules; close coordination with the Attorney General's Office as required. These responsibilities require a continuous data review and report evaluation to determine the status of compliance of owners with standards, policies, rules, regulations, orders, certificates and directives; and the preparation of supporting documents and summaries of data for use in enforcement proceedings. A comprehensive information and data file must be compiled and maintained to carry out these functions. To execute the above functions, personnel in the Division quartered in Richmond, will be assigned, on the basis of river basins, primary responsibility for determining the up-to-date status at all times of existing or potential enforcement actions. These individuals will, within their areas, review propose enforcement cases to ensure appropriate content and consistency with established Board policies and procedures; prepare all evidence necessary for the issuance of a Board order or the prosecution of owners violating State Water Control Law, policies, standards, rules, regulations, orders, certificates and directives adopted or issued by the Board. It is also the responsibility of the Division to provide enforcement liaison with the regional offices and other Bureaus of the agency as well as State and Federal agencies.

Hearings

The Legal Affairs Division has responsibility for conducting all hearings. The hearings officer is Bureau Director, Division Director or other designee. The Legal Affairs Division has full responsibility for issuing hearing notices, keeping verbatum hearing records, hearing records summaries and other actions required to conduct these hearings.

Legal Problems and Policies

The Legal Affairs Division is responsible for the review, legal development and amendment of all Board policies, rules, standards and regulations; maintaining a continual review and critique of all State and Federal legislative amendements relative to water pollution, water resources and related legislation. The Division also has responsibility for critiquing proposed amendments to State and Federal law and for preparation of reports to assist appropriate agency personnel in testimony before committees of the General Assembly and Congress.

Division of Environmental Affairs

The Division of Environmental Affairs is responsible for the following activities:

Permits

The Environmental Affairs Division is responsible for the development of program operating procedures for effective management of the State certification program required as a prerequisite for the Federal permits and licenses (Section 401, PL 92-500); recommending appropriate policies, standards, rules and regulations to prevent pollution developing from dredging, spoil disposal, filling of wetlands, construction of dams, construction of bridges and other such activities affecting the State's waterways. The Division prepares and issues all such certificates and developes and conducts the surveillance programs necessary to ensure compliance with the terms of the certificates.

Environmental Evaluations

The Division has the responsibility for coordinating the review and preparation of written Virginia State Water Control Board staff comments on environmental impact statements and for providing policy direction which assures an intra-agency response consistent with Board policy and which reflects the total environmental responsibilities for coordinating the agencies preparation of written comments and suggestions on private, State and Federal projects which, while not requiring an environmental impact statement, do have an impact on the environmental quality of the Commonwealth's water and wetlands. Such projects include but are not limited to highways, small dams and other small projects which may affect the State's waters or wetlands.

Office of Planning and Administration

Within the Office of Planning and Administration, the following responsibilities and functions assigned to the Assistant Executive Secretary are to be carried out under his general supervision and direction. The office is comprised of

1. Division of Management Services

The Management staff develops, recommends and carries out tasks and activities, including but not limited to: overall program analysis and evaluation and management information systems program planning; budget formulation, preparation and execution; financial management, and emergency preparedness and civil disaster plan coordination.

The Division of Management Services is responsible for administrative preparation for Board meetings, including the preparation and distribution of the final agenda and minute list. Minutes of all Board actions relative to enforcement actions or on other matters submitted by the Division shall be prepared and distributed by the Division. The maintenance and safekeeping of all minutes, records of hearings and other legal records of the Board is also the responsibility of this Division.

2. Division of Administration

The Administration staff is responsible for the development, recommendation and execution of assigned tasks and activities including but not limited to organizational management control and services, personnel management, maintenance of the technical library, drafting and reproduction services, and management of the warehouse including maintenance and repair of equipment.

3. Division of Construction Grants

The Construction Grants staff develops, recommends and carries out assigned tasks and activities including but not limited to the sewerage treatment works construction grant program operation.

4. Division of ADP

The ADP staff is responsible for the development and maintenance of ADP systems for all agency programs.

The staff of SWCB is made up of 345 persons. They can be grouped into four occupational categories as indicated in Table XVII. Most of the engineers are classified by the state as Pollution Control Engineers or Water Resources Engineers. The requirement for these positions is a bachelor's degree in engineering, preferably in environmental, civil, or chemical engineering. A majority of those categorized as scientists are classified by the state as Pollution Control Specialists, and the minimum requirement for this position is a bachelor's degree in chemistry or biology. Ten of the scientists are geologists. The technicians are engineering technicians with requirements of a high school diploma plus a minimum of two years experience or two years of college. Those persons classified in the table as "other" include 69 clerical employees and 70 administrative persons to include accountants, economists, and personnel specialists.

Table XVIII shows the location of SWCB personnel by bureau or regional office.

TABLE XVII

COMMONWEALTH OF VIRGINIA

State Water Control Board
Current (1976) Staffing Level

Position	1976
Engineer	67
Scientist	70
Technician	69
Other	139
TOTAL	345

TABLE XVIII

VIRGINIA WASTE WATER PERSONNEL BY LOCATION

	Office of Executive Secretary and Planning & Administration	Bureau of Enforcement	Bureau of Surveillance Studies	Bureau of Water Control Management	Bureau of Applied Technology	Regional Offices: Valley	West Central	Piedmont	Northern	Tidewater	Southwest	TOTAL
Engineer	2	5	6	10	7	5	5	11	6	7	3	67
Scientist	3	5	17	3		6	10	4	6	10	6	70
Technician	5		11	2	2	5	6	9	8	12	9	69
Administrative	20	3	4	7	8	4	4	6	4	5	5	70
Clerical	20	3	5	4	7	5	5	6	4	7	3	69
TOTAL	50	16	43	26	24	25	30	36	28	41	26	345

Four classifications of waste treatment plant operators exist as provided by SWCB regulations. The classifications are I, II, III, and IV, with Class I being the highest. A description of the four classifications and the requirements for operators, excerpted from state regulations, is as follows:

CLASSIFICATION OF FACILITIES	OPERATOR REQUIREMENTS
Class I	Class I
a) Sewage or industrial wastewater works utilizing biological treatment methods, such as, but not limited to, activated sludge, biological coagulation, aerobic digestion, extended aeration, aerated lagoons, trickling filters, or any combination thereof, and having a rated design hydraulic capacity of 5.0 mgd or more.	a) Bachelor of Science degree in science or engineering and two years of responsible charge of operation of treatment plants of Class II or higher, or
	b) Four years of college with a major in science and three years of responsible charge of operation of treatment plants of Class II or higher, or
b) Industrial wastewater works utilizing physical and/or chemical treatment methods, such as, but not limited to, neutralization, chemical coagulation, sedimentation, filtration, or other processes, or any combination thereof, and having a rated design hydraulic capacity of 5.0 mgd or more.	c) Holder of Class II certificate with five years of acceptable operating experience, two years of which are in responsible charge.
c) Industrial wastewater works utilizing any combination of biological, physical and/or chemical treatment methods, such as, but not limited to, activated sludge, extended aeration, aerated lagoons, trickling filters, or other biological processes, in combination with neutralization, chemical coagulation, sedimentation, filtration, or other processes, and having a rated design hydraulic capacity of 2.5 mgd or more.	

CLASSIFICATION OF FACILITIES	OPERATOR REQUIREMENTS
Class II	Class II
a) Sewage works having a rated design hydraulic capacity of 1.0 mgd and above.	a) Bachelor of Science degree in science or engineering and one year of responsible charge of operation of treatment plants of Class III or higher, or
b) Sewage or industrial wastewater works utilizing biological treatment methods, such as, but not limited to, activated sludge, biological coagulation, aerobic digestion, extended aeration, aerated lagoons, trickling filters, or any combination thereof, and having a rated design hydraulic capacity of at least 0.5 mgd but less than 5.0 mgd.	b) Associate of Applied Science degree in environmental technology awarded after completion of a two-year course in water and waste water plant operation and two years of acceptable experience in operation of treatment plants of Class III or higher, one year of which is responsible charge, or
c) Industrial wastewater works utilizing physical and/or chemical treatment methods, such as, but not limited to, neutralization, chemical coagulation, sedimentation, filtration, or other processes, or any combination thereof, and having a rated design hydraulic capacity of at least 0.5 mgd but less than 5.0 mgd.	c) Two years of college with major in engineering, bacteriology, chemistry, or public health and three years of acceptable experience in operation of treatment plants of Class III or higher, one year of which is in responsible charge, or
d) Industrial wastewater works utilizing any combination of biological, physical and/or chemical treatment methods, such as, but not limited to, activated sludge, extended aeration, aerated lagoons, trickling filters, or other biological processes, in combination with neutralization, chemical coagulation, sedimentation, filtration, or other processes, and having a rated design hydraulic capacity of at least 0.1 mgd but less than 2.5 mgd.	d) Graduation from high school and five years of acceptable experience in operation of treatment plants of Class III or higher, one year of which is in responsible charge, or
e) Sewage works utilizing advanced wastewater treatment facilities and having a rated design hydraulic capacity of at least 0.1 mgd but less than 2.5 mgd.	e) Holder of Class III certificate and four years of acceptable experience in plant operation.

CLASSIFICATION OF FACILITIES	OPERATOR REQUIREMENTS
Class III	Class III
a) Sewage works having a rated design hydraulic capacity of at least 0.04 mgd but less than 1.0 mgd and all stabilization ponds with a rated design hydraulic capacity of 0.04 mgd or more.	a) Graduation from high school with training in chemistry or bacteriology and one year of experience in operation of treatment plants of Class IV or higher, or
b) sewage or industrial waste water works utilizing biological treatment methods, such as, but not limited to, activated sludge, biological coagulation, aerobic digestion, extended aeration, aerated lagoons, trickling filters, or any combination thereof, and having a rated design hydraulic capacity of less than 0.5 mgd and certified by the State Water Control Board.	b) Two years of high school or successful completion of two or more specialized courses under B-3 (a) above, and two years of acceptable operation of treatment plants of Class IV or higher, or
c) Industrial waste water works utilizing physical and/or chemical treatment methods, such as, but not limited to, neutralization, chemical coagulation, sedimentation, filtration, or other processes, or any combination thereof, and having a rated design hydraulic capacity of less than 0.5 mgd.	c) Successful completion of one or more specialized courses under B-3 (a) above and three years acceptable operation of treatment plants of Class IV or higher, or
d) Industrial waste water works utilizing any combination of biological, physical and/or chemical treatment methods, such as, but not limited to, activated sludge, extended aeration, aerated lagoons, trickling filters or other biological processes in combination with neutralization, chemical coagulation, sedimentation, filtration, or other processes, and having a rated design hydraulic capacity of less than 0.1 mgd.	d) Holder of Class IV certificate and four years of acceptable experience in plant operation.
e) Sewage works utilizing advanced waste water treatment facilities and having a rated design hydraulic capacity of less than 0.1 mgd and certified by the State Water Control Board.	

CLASSIFICATION OF FACILITIES	OPERATOR REQUIREMENTS
Class IV	Class IV
a) Sewage works utilizing treatment having a rated design hydraulic capacity less than 0.04 mgd and certified by the State Water Control Board.	a) Grammar school (8th grade) or equivalent education, completion of at least one specialized course under B-3 (a) above, and one year of acceptable operating experience.
b) Industrial waste water works utilizing biological or other treatment processes and certified by the State Water Control Board as nondischarging.	
c) Industrial waste water works utilizing only physical processes, such as, but not limited to, sedimentation of inorganic or inert solids, regardless of the flow, and certified by the State Water Control Board.	

Program officials estimate that there are 1,283 certified waste water treatment operators in the state and that this represents about one-half of the total number of operators in Virginia. Each certified facility must have at least one certified operator. Table XIX indicates the number of certified applicators by class and is based on estimates provided by program managers.

TABLE XIX

COMMONWEALTH OF VIRGINIA

Certified Waste Water Treatment Plant Operators
Current (1976) Staffing Level

Classification	1976
I	299
II	241
III	472
IV	271
TOTAL	1,283

Current information regarding personnel other than operators at waste treatment facilities was not available. However, the state conducted a survey in July, 1975, of domestic and industrial treatment plants to determine occupational responsibilities. It is believed by program personnel that the figures in that study are still representative of the types of positions available at treatment plants and the ratio of operators to other personnel. Table XX taken from that study, indicates that operators comprised 42 percent of the plant workforce at domestic facilities and 35 percent at industrial plants. In both cases, operators represent the largest percentage of the occupations listed.

TABLE XX

Wastewater Treatment Facility Staffing
(From 1975 Study)

	DOMESTIC				INDUSTRIAL				
OCCUPATIONAL GROUPS	Current Staffing	Percent of Workforce	No. of Vacancies	Turnover Rate (%)	Current Staffing	Percent of Workforce	No. of Vacancies	Turnover Rate (%)	Staffing TOTAL
Operations Management/Supervision	220	15	2 (1)	1	98	20	--	2	318
Wastewater Operators	610	42	33 (5)	20	167	35	1	1	777
Chemists/Lab Techs.	92	6	8 (8)	6	60	13	--	10	152
Maintenance Personnel	225	15	17 (7)	8	92	19	1	3	317
Laborers/Helpers	305	21	16 (5)	21	60	13		5	365
TOTALS	1,452		76 (5)	11% (average)	477		2	4.6% (average)	1,929
	Surveyed	Represents 68% sample of domestic wastewater treatment facilities (212 facilities reporting out of 310)			Surveyed	Represents 41% sample of of industrial wastewater treatment facilities (89 facilities reporting out of 216)			

C. Workforce Projections

Data contained in this section are based primarily on the best estimates provided by professionals working in the program and through the use of materials provided by them.

Growth in terms of SWCB personnel is expected to be low. Program managers anticipate the program to increase by about three to five percent over the next five years. This is reflected in Table XXI below. The greatest increase, both in numbers and percentages, will be in the engineer and scientist categories. Because board officials expect the job classifications to remain the same, those hired will mostly be Pollution Control Specialists. Only a very small increase is anticipated for technicians and clerical and administrative personnel.

TABLE XXI

COMMONWEALTH OF VIRGINIA

State Water Control Board
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	67	70	75	79	83	87		5%
Scientist	70	72	76	80	84	88		5%
Technician	69	69	70	71	72	73		1%
Other	139	139	140	142	144	145		1%
TOTAL	345	350	361	372	383	393	N/A	3%

Considerable growth is anticipated by program personnel in the operation of waste treatment facilities. Estimates are that municipal plants along will require an additional 100 new persons each year through 1980 due to upgrades, expansions, and new plants. During the same period, industrial facilities are expected to require an increased workforce of about five

percent per year. About one third of the anticipated additional new persons per year will be operators.

The increase in personnel anticipated, along with an intensified effort by the SWCB to certify operators, is expected to increase the number of certified operators by over fifty percent in the next five years as shown in Table XXII. This averages out to approximately an eleven percent per year increase. All classifications are expected to increase except for Class IV which is expected to decrease because the Board anticipates that in the future, plants classified as non-discharging will not require certified operators. Some of those with Class IV certificates will upgrade them.

TABLE XXII

COMMONWEALTH OF VIRGINIA

Waste Water Treatment Plant Operators
Workforce Projections to 1982 (est.)

CLASSIFICATION	1976	1977	1978	1979	1980	1981	% annum turnover (average)	% annum growth/decline (average)
I	299	329	362	398	438	482		10%
II	241	265	292	321	353	388		10%
III	472	590	737	921	1091	1281		22%
IV	271	312	318	282	253	197		-5%
TOTAL	1283	1496	1709	1922	2135	2348	5%	13%

Although the 1975 study referred to earlier had listed operator turnover to be about 20 percent in municipal plants and one percent in industrial plants, current estimates indicate that turnover among operators has dramatically decreased, due largely to a depressed labor market. The 1975 figures reflected unusually high turnover rates in some small municipal facilities and the industrial rate was considered by the SWCB to be an approximation. A more realistic current turnover rate among certified operators is thought to be about five percent.

As previously mentioned, the SWCB anticipates the addition of 100 new people per year in waste water treatment facilities, and two-thirds of these will be persons other than operators. Most of these are expected to be maintenance personnel and laborers, although no current projections for these positions are available.

D. Training and Certification

The SWCB has the responsibility for ensuring the availability of trained operators for Virginia's waste treatment facilities. The Board has a staff of nine persons devoted to training activities which include: technical assistance and on-the-job training in plant startups, operation and lab analysis instruction to small plants; providing assistance to correct deficiencies in larger facilities; and special training programs.

The Board has used EPA training grants to conduct many of its programs which have included:

a) Correspondence Course for Plant Operators;

b) Sixty-hour hands-on laboratory techniques training at waste water treatment plants (for operators and technicians);

c) Specialized courses in the various treatment processes (presented usually as 30-hour offerings, but also as one-day workshops);

d) Sewer Line Inspector Workshops (one and one-half day seminars on methods for reducing infiltration through proper inspection techniques);

e) Certification Preparation Courses (30 hours).

Workshops conducted at selected locations throughout the state include:

a) Certification Preparation: a basic program designed to prepare operators to take the Class III or IV (lowest) level examination. This particular program is five days in length.

b) Stabilization Ponds and Lagoons: designed to provide information on the control and proper operation of ponds and lagoons. This program is three days in length.

c) Package Plant Operation: designed to provide information on maintenance and operation of the extended aeration or contact stabilization type package plant. This program is two days in length.

The most extensive training project conducted by the SWCB is the development and operation of the Virginia Waste Water Treatment Plant Operator Center, located at the J. Sargeant Reynolds Community College outside Richmond. The board provides the administrative staff for the center as well as the instructional staff for waste water operations. The State Department of Health and fifteen other community colleges throughout the state are participating in this project. The program, which began in late 1976, is designed to provide a comprehensive waste water treatment program for those individuals desiring to obtain operator certificates and for those wishing to go on to get Environmental Technology Associate degrees. A description of the program, its objectives, and courses offered, all provided by SWCB officials, follows.

VIRGINIA WASTE WATER TREATMENT PLANT OPERATOR CENTER

PROGRAM DESCRIPTION

The centers' program is designed to meet the training requirements of today's operator. By offering the program statewide and on a continuous basis, it allows the operator a chance to attend any course that applies to his/her work. The center will use a modular approach in which all subject matter will be presented in short duration programs. These modules can be used to form full college level courses which can then be applied toward the academic certificate or Associate Degree programs offered by the community colleges.

The Module

The module is a short term course of instruction on one specific subject area. It is the basic component of the centers' program. All units of instruction offered by the center are in the modular format. Each module will carry college credit and will require from ten to eighteen hours of class time per credit. Due to the short duration of each program, classes may be scheduled to meet the demand of the trainees, (i.e., full day, half day, or evening). Modules will be composed of lectures, lecture/laboratory, and/or field trips.

The module format provides a greater opportunity for the operator to participate in the program and also provides a method for continuing training to any level desired. Through the use of short period, specialized modules, the operator can select a specific program, and only lose a minimal amount of time from the job. In many cases, it may be possible for the interested operator to select modules which will not require absence from work at all.

In summary, several important advantages over the standard training approach are features:

1) Instruction is concentrated in short time periods.

2) The student can select the modules considered most beneficial for his/her particular situation.

3) The system has flexibility which will allow programs to be developed to meet any current or future demand.

4) Modules can be structured around programmed learning devices, making training more available to operators in small communities who may not be able to attend courses which require their absence for even short periods of time.

The Course

The second component in the program is the complete college course. Each module is actually a part of the larger, complete course. Individual modules are grouped together to form full college level courses.

The number of modules required to complete a particular course is dependent upon the credit value of the course. For example, a three-credit lecture course will require three modules of approximately 10 clock hours each, while a five credit, lecture and lab course will require five modules of approximately 18 hours each.

The Certificate

The third phase of the program is the certificate. This is the ultimate training available through the training center. The certificate program is entitled Environmental Operations Specialist and is designed to provide the training required to operate or supervise operation of a wastewater treatment facility or to perform the analysis required to monitor and control the facility.

The certificate program is the final step of the training available through the modular approach of the center. However, the trainee may participate in the Environmental Technology Associate degree program of the college. In fact, the majority of the courses in the certificate program will apply directly to the Associate Degree Program.

The Certificate Program is designed as a four quarter, minimum 55 credit-hour program. Assuming an operator could attend the program full-time and assuming that all the required modules were presented in sequence, the program could be completed in approximately 35 weeks.

PROGRAM OBJECTIVES

The Center's program is designed to provide training to all aspects of the pollution control industry. Specific objectives of the program are as follows:

1) To provide entry level personnel with basic training in plant operations, equipment maintenance, and laboratory testing as well as a basic knowledge of such support subjects as chemistry, mathematics and,communication skills.

2) To provide skill improvement for operators with varying levels of experience and educational background through instruction and "hands-on" training in the operation and maintenance of specific unit processes wastewater treatment.

   The program strives to provide improvements in the technical expertise and the supportive skills of the operator, which will result in more efficient operation of waste treatment plants and improvement of the operator's ability to communicate the needs and accomplishments of his/her facility. Through this program the operator will

achieve a second objective and will be better prepared to take the state certification exam.

3) To provide regulatory personnel with the practical expertise necessary to conduct more effective surveillance and monitoring programs. The training provided is also vital to the continuation of the cooperative programs of assistance developed between the regulatory agencies and treatment facilities.

4) To provide supervisory personnel with administrative training in all phases of supervision and management. Subjects in the program include personnel, plant accounting system, record keeping, safety programs, orientation to treatment plant operation and maintenance, and public relations programs.

5) To provide administrators with a general overview of: treatment plant operation, the cost of supplying and operating the plant, the expected efficiency of the plant, the impact of polluted waters on the environment, personnel and hiring, and emergency conditions.

6) To provide engineers with practical knowledge of operational and maintenance problems of treatment plants by in-class instruction and related field training. This program will establish lines of communication so often lacking between design engineer and operator.

Personnel of the SWCB receive informal on-the-job training which is designed to acquaint new personnel with the water pollution control laws and regulations and with the operations of the board. The state also offers a program by which it will pay tuition costs of job-related courses offered by colleges and universities. Management training is also provided for personnel of the supervisor level and higher.

Virginia became involved in operator certification in 1961, with the initiation of a voluntary program set up by the association for water and waste water operators. A mandatory certification law was passed in 1970, requiring all water and waste water operators in responsible charge to be certified by January 1, 1973. A Board of Certification of Water and Waste Water Works Operators was established, within Virginia's Department of Professional and Occupational Regulation, to administer the program. The board is composed of seven members including the Executive Secretary of the State Water Control Board; the Director of the Division of Engineering of the State Department of Health; and five members, appointed by the Governor, who include two representatives each from water and wastewater facilities, (each having the highest level certification), one representative each of owners of water and waste water plants, and one member from academia.

Program officials believe that the mandatory certification program is beneficial to both the state and the operator. They believe it has had a considerable impact in making operator occupations more desirable both professionally and financially. A comprehensive survey of state certification procedures was completed in July, 1975 by the Association of Boards of Certification and the data from the study pertaining to Virginia are contained in Table XXIII.

TABLE XXIII

COMMONWEALTH OF VIRGINIA

Survey of Certification Practices

Certification Authority	Exams Prepared by	Exams Rewritten, Frequency	Exams Administered by	Exams Graded by	Exams Given, Frequency/yr	Exams Given, No. of Locations
VIRGINIA	R	2 yr	R	R	2	5

R - Regulatory Agency
I - Instructor or Training Officer
B - Certification Board or Authority
P - Proctor
C - Private Contractor

	Type of Question Included											
	At Lowest Grade Level						At Highest Grade Level					
Certification Authority	True-False	Multi-Choice	Essay	Oral	Open Book	Math	True-False	Multi-Choice	Essay	Oral	Open Book	Math
VIRGINIA	--	--	--				--	--	--			

X - Included in Examination
-- Not Included in Examination

Certification Authority	Average Time Needed to Complete Examination (hr)				Required Passing Score (%)				Proportion Passing (%)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
VIRGINIA	1	1	2	3	70	70	70	70	50	50	50	50

E. Career Potential

Opportunities for future jobs within the SWCB will be limited over the next five years. Specifically, the needs that do exist will be for professionally trained personnel such as Pollution Control Engineers and Pollution Control Specialists, who are required to have four-year degrees. Only a minimal demand is anticipated for persons without professional training, such as technicians and clerical personnel.

More significant is the projected demand for waste water plant operators. Because of new facilities and expansion of current plants, the need for certified operators is expected to increase at a rate of about 11 percent per year. With the recent introduction by the state of a comprehensive waste treatment operator training program offered through the community college system, a formal means for obtaining certification now exists throughout the state for all persons wishing to avail themselves of the opportunity. Additional positions are expected to be available at municipal and industrial treatment plants, however, it is anticipated that these will require laborers or maintenance personnel.

F. Conclusion

Virginia's waste water program is under the jurisdiction of the State Water Control Board which is responsible for implementation of the state's water pollution control laws and regulations. Activities of the board include the municipal construction grants program, sewer programs, administration of the National Pollutant Discharge Elimination System permits, industrial permits, and surveillance monitoring.

The SWCB has a staffing level of 345 persons to carry out these activities. The total figure is divided almost equally among the categories of engineer, scientist, technician, administrative, and clerical. There are also almost thirteen hundred certified waste treatment plant operators in Virginia, which has a mandatory certification law requiring at least one certified operator at each treatment facility.

Although growth within the SWCB is anticipated to be slight over the next five years, among treatment plant personnel growth is expected to be considerable. Operator training will be on the increase with the development by the state of a comprehensive operator training program conducted through the community college system.

VIII. ENERGY

A. Introduction

The Virginia Energy Office was created by an Executive Order of the Governor on September 6, 1974, to administer the state set-aside program for hardship and emergency allocation requirements and other programs which may require its attention. The office has the following purposes:

1) to implement energy allocation or conservation programs;

2) to establish contingency allocation plans for fuel, oil, gasoline, and other energy resources;

3) to encourage cooperative efforts by and among Virginia business, industry, utilities, the academic community, state, local, and federal governments and private institutions to develop conservation programs and sources of energy.

Other major programs in which the Virginia Energy Office is currently involved include:

A) Data Collection: developing an energy profile of the State by industry and geographical area; anticipate identifying the energy uses of 7,000 industrial and commercial firms; primary purpose is to identify natural gas consumers.

B) Consumer Affairs: prepare a survey of the Emergency Energy Financial Assistance in the state.

C) Public Information: 1) monthly publication of the Virginia Energy Review; 2) working directly with the State Board of Education in developing energy educational plans for the junior and senior high schools; 3) establish an Energy Information and Conservation Center to store documents which are available for public use.

D) Conservation: conducting regional energy conferences with the Planning District Councils.

There are currently two nuclear generating plants in operation in Virginia, and six more plants planned or under construction. All of these operating plants and those planned are under the control of Virginia Electric and Power Company.

B. Workforce Profile

The Virginia Energy Office currently has a total staff of eleven persons. One position, that of deputy director, is currently vacant. The following table depicts the staffing level of the Office.

TABLE XXIV

VIRGINIA ENERGY OFFICE CURRENT (1976) STAFFING LEVEL

Position	1976
Director	1
Conservation Coordinator	1
Allocations Supervisor	1
Allocators	2
Information Specialist	1
Media Specialist	1
Bookkeeper	1
Clerks	3
TOTAL	11

C. Workforce Projections

The Energy Office is anticipating increasing its staffing level to twenty persons within the next two years. The primary reason for staff growth is to implement the mandates required for formation of state energy and conservation plans under the Federal Energy Policy and Conservation Act. The Energy Office expects to recruit an assistant technical services coordinator, a technical services coordinator, a government programs coordinator, a communities and industrial programs coordinator, and several assistants and clerical support personnel.

D. Training and Certification

Energy Office Administrators consider their present staff to be highly trained and experienced in their fields. The Office attempts to recruit personnel who are already highly trained in the energy policy making field so that additional training will not become necessary. Any training that is offered for present staff is on-the-job.

E. Career Potential

Career potential within the Virginia Energy Office is anticipated to dramatically improve within the next two years for coordinator positions. Professionals likely to be hired by the office will probably have administrative expertise rather than a specific technical background. Persons with administrative experience at educational institutions may be recruited as the Virginia Energy Office works closely with the State Board of Education in developing energy educational plans for the state's schools.

In the private sector, additional personnel are anticipated to be recruited for pollution control and abatement jobs within the next five to ten years. They will work at nuclear generating plants which are to be constructed. These positions will be recruited by Virginia Electric and Power Company which is the utility responsible for the planning and instructions of these nuclear generating plants.

F. Conclusion

The Virginia Energy Office is gradually enlarging its program of operation to include implementation of state energy and conservation planning under the Federal Energy Policy and Conservation Act. By 1979 the office is anticipated to have a total of twenty persons on its staff, and most of its additional personnel will most likely have administrative or managerial experience.

Virginia also currently has two nuclear generating facilities in operation, and six more either under construction or in the planning stages of development. It is apparent that the career potential for public and private sector energy jobs will increasingly improve in the short- and long-term future.

Selected Post Secondary Institutions With Formal Environmental Energy Programs

There are several colleges and universities in Virginia which offer programs in environmental science and pollution control technology. Information on these programs was gathered from college catalogues selected on the basis of recommendations by professionals in the field, and phone calls to department heads. Only a small percentage of the schools in the state were included in our sample; thus, the programs outlined in this section simply represent the kinds of pollution control training available in the state at the two year, four year, and post graduate college levels. These programs are designed to prepare students for technical or professional positions in pollution control and related areas.

Included in this section are Virginia Polytechnic Institute, which offers Master of Science and Ph.D. programs in Civil Engineering with an Environmental Emphasis, and the J. Sargeant Reynolds Community College, which offers an Associate in Science Degree in Environmental Technology with options in Environmental Health and Environmental Engineering.

SENIOR INSTITUTIONS

Virginia Polytechnic Institute
Blacksburg, Virginia

Program: Civil Engineering with Environmental Emphasis (M.S., Ph.D.)

Hours required for major: Quarter - (M.S.) 45, (Ph.D.) 135 post undergraduate degree
Program Inception: 1945
Staff Size: Three professors, three associate professors, one assistant professor (7 Ph.D.)
Enrollment: (M.S.) 36, (Ph.D.) 14
Graduates (1976): (M.S.) 28, (Ph.D.) 3
Placement: 50
Graduate Work (Ph.D.): 1

Courses

Civil Engineering Materials Technology
Applied Hydraulics
Environmental Engineering Chemistry
Stress Analysis
Steel and Concrete Design
Environmental Engineering Laboratory
Design of Water and Sewer Systems
Air Pollution
Environmental Engineering Design
Plant Operation
Environmental Health I, II

COMMUNITY COLLEGES/TECHNICAL INSTITUTIONS

J. Sargeant Reynolds Community College
Richmond, Virginia

Program: Environmental Technology (A.S.)

Hours required for major: Quarter - 107-8
Program Inception: 1974
Staff Size: One instructor (M.S.) plus four to six part-time instructors.
Enrollment: 25
Graduates (1976): 4
Placement: 4
Graduate Work: 0

Courses - Environmental Health Option

General Chemistry I, II, III
Introduction to Graphic Representation
Communication Skills I
Public Health I, II
Engineering Technical Mathematics I, II, III
Technical Writing
American Constitutional Government
Engineering Mechanics
Introduction to Water and Wastewater Treatment Technology
Environmental Microbiology
Water Purification I, II
Cooperative Education in Environmental Engineering
Human Relations
Oral Communications
Hydraulics
Survey of American Economics
Introduction to Air Pollution
Sanitary Biology and Chemistry I, II, III
Principles of Epidemiology
Wastewater Treatment Plant Operation
Solid Waste Management
Seminar and Project in Environmental Health
Principles of Food Sanitation
Environmental Health Planning

Courses - Environmental Engineering Option

General Chemistry I, II, III
Introduction to Graphic Representation
Communication Skills I
Public Health I, II
Engineering Technical Mathematics I, II, III
Technical Writing

Civil Engineering Drafting I, II
Engineering Mechanics
Introduction to Water and Wastewater Treatment Technology
Environmental Microbiology
Water Purification I, II
Cooperative Education in Environmental Engineering
Human Relations
Oral Communications
Hydraulics
Survey of American Economics
Introduction to Air Pollution
Sanitary Biology and Chemistry I, II, III
Water Supply and Wastewater Collection
Wastewater Treatment Plant Operation
Seminar and Project in Environmental Health
Industrial Waste Treatment
Surveying I
American Constitutional Government

State Legislation

VIRGINIA GENERAL

TITLE:

Environmental Impact Report Law
Virginia Code 10-17.107

PURPOSE:

To provide for the making of environmental impact reports to assist in environmental protection.

DEFINITIONS:

1. Environment
2. Major state facility
3. Council

ADMINISTERING AUTHORITY:

Governor's Council on the Environment
All State Agencies

AUTHORIZATIONS:

To prepare environmental impact report (EIR) for proposed state facilities;
To review all EIRs and proposed facilities;
To coordinate operation of the act.

VIRGINIA GENERAL

TITLE:

Environmental Quality Act
Virginia Code 10-181

PURPOSE:

To provide for a council on the environment and to establish certain of its duties.

DEFINITIONS:

ADMINISTERING AUTHORITY:

Council on the Environment

AUTHORIZATIONS:

To develop coherent environmental management policies;
To coordinate state environmental agency budgets;
To assist in permit issuance programs;
To report annually to the Governor and General Assembly.

VIRGINIA AIR

TITLE:

Air Pollution Control Law
Virginia Code 10-17

PURPOSE:

To achieve and maintain such levels of air quality as will protect human health, welfare and safety.

DEFINITIONS:

1. Board
2. Air pollution
3. Owner
4. Special order
5. Certified pollution control equipment and facilities
6. State certifying authority

ADMINISTERING AUTHORITY:

Air Pollution Control Board
Advisory Committee on Air Pollution

AUTHORIZATIONS:

To conduct studies and investigations regarding air pollution;
To initiate air pollution control education;
To issue regulations pursuant to the act;
To issue orders and enforce the act;
To create local air pollution control districts;
To enter and inspect property in enforcement of the act;
To exempt from state taxation all certified pollution control equipment and facilities.

PROHIBITED ACTS:

To cause or allow air pollution in violation of regulations;
To violate any orders of the Board;
To operate motor vehicle without pollution control equipment;
To violate any other provisions of the act.

PENALTIES:

Fines of up to $1,000.

VIRGINIA PESTICIDES

TITLE:

Pesticide Use and Application Act of 1975
Virginia Code 3.1-249.1

PURPOSE:

To provide for the control of pesticide use and safety through the certification of applicators.

DEFINITIONS:

1. Board
2. Certified applicator
3. Commercial applicator
4. Private applicator
5. Commissioner
6. Committee
7. Competent
8. Restricted use pesticide
9. Under the direct supervision
10. Unreasonable adverse effect on the environment

ADMINISTERING AUTHORITY:

Department of Agriculture and Commerce
Pesticide Advisory Committee

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To classify pesticides and restrict their usage;
To regulate storage, transportation and disposal of pesticides;
To establish certification standards;
To categorize commercial applicators;
To certify commercial and private applicators;
To enter and inspect property in enforcement of the act.

CERTIFICATION OR LICENSING:

Commercial and private applicators of restricted use pesticides must be certified and show competence;
Ten categories established for commercial applicators.

PROHIBITED ACTS:

To use restricted use pesticides without proper certification;
To violate other pesticide use and disposal requirements;
To fail to comply with pesticide labeling;
To violate any other act provisions.

EXEMPTIONS:

Laboratory research and physicians and veterinarians.

PENALTIES:

Violation constitutes a Class 2 misdemeanor.

VIRGINIA POTABLE WATER

TITLE:

Groundwater Act of 1973
Virginia Code 62.1-44.83

PURPOSE:

To provide for the control of all groundwater resources in the state, and to protect and beneficially utilize the groundwater of the state.

DEFINITIONS:

1. Altering or rehabilitating
2. Artificial storage
3. Board
4. Certificate of groundwater right
5. Constructing
6. Critical groundwater area
7. Department
8. Groundwater
9. Groundwater area
10. Permit
11. Person
12. Pollution
13. Registration statement
14. Well

ADMINISTERING AUTHORITY:

State Water Control Board
State Health Department

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To encourage voluntary agreements among groundwater users;
To supervise groundwater uses and administer critical groundwater uses;
To require registration by users of critical groundwater areas;
To generally supervise groundwater uses in the state.

PROHIBITED ACTS:

To fail to keep records or register uses as may be required;
To enlarge critical area groundwater use without prior approval;
To violate other provisions of the act or regulations.

EXEMPTIONS:

Registration not required for non-critical area use, general beneficial uses, uses not exceeding 50,000 gallons per day.

PENALTIES:

Fines of from $10 to $250.

VIRGINIA WASTE WATER

TITLE:

State Water Control Law
Virginia Code 62.1-44.2

PURPOSE:

To safeguard clean waters of the state from pollution, prevent any increase in pollution, and reduce the existing pollution in order to provide for the health, safety, and welfare of the citizens.

DEFINITIONS:

1. Board
2. Member
3. Certificate
4. State waters
5. Owner
6. Pollution
7. Sewage
8. Industrial wastes
9. Other wastes
10. Establishment
11. Sewerage system
12. This law
13. Rule
14. Special order
15. Ruling
16. Regulation
17. Standards
18. Policies
19. Discharge
20. Oil, petroleum products and tneir by-products
21. Oil refinery
22. Vessel

ADMINISTERING AUTHORITY:

State Water Control Board
State Department of Health

AUTHORIZATIONS:

To generally supervise the control over quality of all state waters;
To study and investigate state water pollution matters;

AUTHORIZATIONS (Cont'd):

To establish water quality standards and water policies;
To administer a discharge of sewage certificate program;
To enforce all certificates and standards;
To issue regulations pursuant to the act;
To investigate any large-scale killing of fish;
To establish basinwide water quality management programs;
To establish waste treatment centers;
To act as the state lead agency in water pollution matters;
To provide technical assistance in sewage treatment matters;
To approve sewage treatment plans;
To control pollution from boats and other vessels;
To have responsibility for conservation and utilization of state water resources;
To enter and inspect property in enforcement of the act;
To report annually to the governor and general assembly.

PROHIBITED ACTS:

To operate or construct potential discharge establishments without prior approval;
To fail to comply with any Board order;
To cause or allow petroleum discharges from any boat or vessel;
To violate any water quality standards;
To violate the terms or conditions of any certificate issued;
To violate any regulations or other provisions of the act.

PENALTIES:

General violations - fines of up to $10,000;
Willful violations - fines of from $100 to $25,000;
Liability also imposed for any petroleum discharge cleanup operations.

VIRGINIA WASTE WATER

TITLE:

Water and Wastewater Works Operators Law
Virginia Code 54-573

PURPOSE:

To protect the public health and welfare, protect water resources of the state, and require the certification of water and waste water works operators.

DEFINITIONS:

1. Board
2. Certificate
3. Waterworks
4. Waste water works
5. Operator
6. Owner
7. Person

ADMINISTERING AUTHORITY:

Board for Certification of Operators of Water and Waste-water Works

AUTHORIZATIONS:

To certify water and waste water facility operating personnel;
To classify all water and waste water works;
To issue regulations pursuant to the act.

CERTIFICATION OR LICENSING:

Operators must be certified corresponding to facility classification; examination is required. No exam required for prior operators or those voluntarily certified.

PROHIBITED ACTS:

To operate a water or waste water works without a properly certified operator;
To perform the duties of an operator without proper certification.

EXEMPTIONS:

Interim operation without certified operator allowed in emergencies.

PENALTIES:

Violation constitutes a misdemeanor.